PRACTICAL SCHOOL GARDENING

P. ELFORD & S. HEATON

OXFORD
AT THE CLARENDON PRESS

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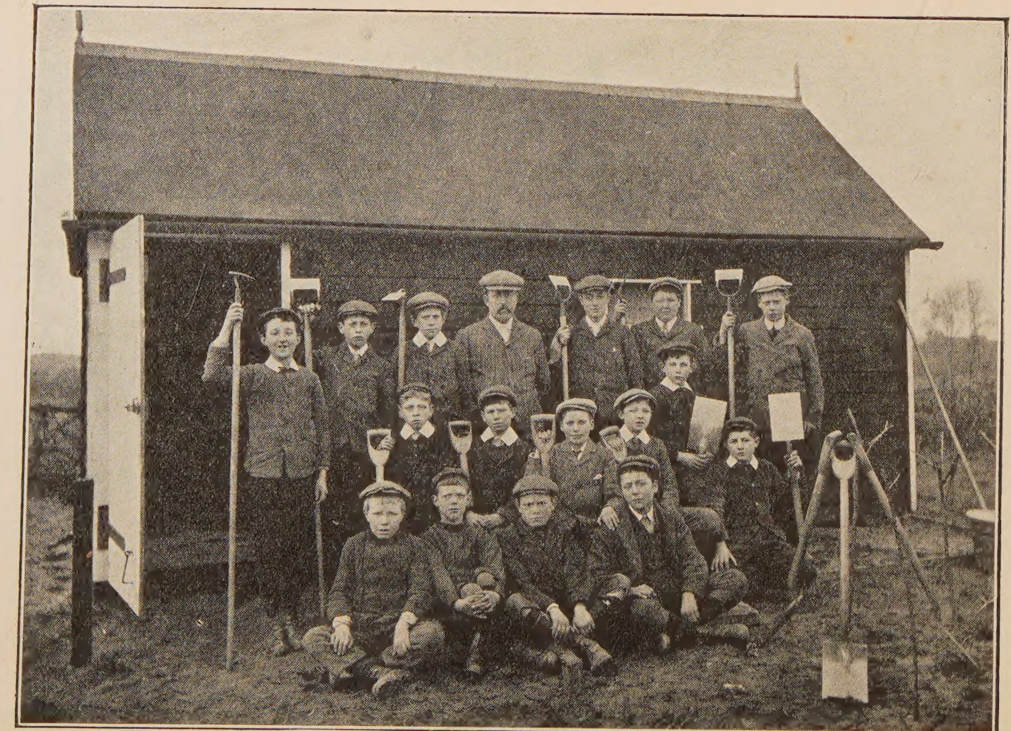
[*June 1922.*



Gardening Boys and Tool Shed, Steeple Aston, Dr. Radcliffe's School.

PRACTICAL SCHOOL GARDENING

BY

PERCY ELFORD, M.A., F.C.S.
SECRETARY TO THE OXFORDSHIRE EDUCATION COMMITTEE
FORMERLY FELLOW OF ST. JOHNS COLLEGE, OXFORD

AND

SAMUEL HEATON, F.R.H.S.
STAFF INSTRUCTOR IN HORTICULTURE TO THE OXFORDSHIRE EDUCATION COMMITTEE
FORMERLY STAFF INSTRUCTOR IN HORTICULTURE TO THE TECHNICAL INSTRUCTION COMMITTEE OF THE ISLE OF WIGHT

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PREFACE

It has been a difficulty experienced by all interested in School Gardening to supply the information to the teachers of the subject who, although often expert practical gardeners, yet require information which is not obtainable in any one book we have been able to discover, except in manuals of large size and whose cost makes it impossible to obtain them.

It was in the hope of meeting this difficulty that we undertook the production of this book; and the book, although written primarily for Elementary School Teachers, has been written in such simple language, and every operation has been so explained that it may be placed in the hands of the older boys, and will, it is thought, prove suitable as a book which may be given as a reward to boys leaving school.

Professional gardeners will find in it information which is not usually at their disposal and which should prove of value to them. The *School Garden Note Book* which has recently been published by the Oxford University Press, is intended to be used by every boy receiving instruction in School Gardening under such a scheme as we have indicated in the book.

Every effort has been made to ensure the correctness of the information and the advice and assistance of experts in the different branches has been sought.

Our thanks must be given ungrudgingly to the following gentlemen for not only reading the proofs and correcting slips and mistakes, but also for much useful advice and many suggestions which have been embodied in the text: Mr. W. Somerville, Sibthorpian Professor of Rural Economy, Oxford; Mr. J. Percival, Professor of Agriculture, University College, Reading; Professor A. D. Hall, Experimental Station, Rothamsted; W. Bliss, Esq., J.P.C.A., Chairman of the Higher Education Sub-Committee, Oxfordshire County Council; Mr. J. E. Jefferies, seedsman, Oxford; Mr. J. S. Chidlow, head gardener to Mrs. G. Herbert Morrell, Headington Hill Hall, Oxford; Mr. A. Wallace, fruit foreman to Messrs. J. Cheal & Sons, Lowfield Nurseries, Crawley; Mr. Brown, of Messrs. Sutton & Sons, Royal seedsmen, Reading; Mr. T. E. Foort of Messrs. Foort & Son, Oxford; Mr. W. F. Jeeves.

Our thanks are due also to Mr. P. E. Meadon, Assistant Secretary to the Oxfordshire Education Committee, for much scholastic advice, and to Mr. W. H. Piggott, late Head Master of the Bicester Church of England School, whose records have enabled us to supply in the appendices information which we believe to be unique.

Mr. W. T. Creswell, the Head Master of Clifton Hampden Church of England School, has supplied us with photographs to illustrate certain matters; Messrs. Sutton & Sons, of Reading and Messrs. J. Cheal & Sons, of Crawley, have lent various photographic blocks, the former of insect pests and the latter of shapes of fruit trees, to whom we are deeply indebted.

Lastly, the assistance given to us by the Oxford University Press, has been of the greatest value.

June, 1909.

P. ELFORD,
S. HEATON.

PREFACE TO THE SECOND EDITION

A number of additions and alterations have been incorporated in the present edition; these we hope will be of great practical value.

October, 1920.

P. ELFORD,
S. HEATON.

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INTRODUCTION

Writers of books on School Gardening have opportunities of attacking the subject in various ways. They may write a Manual of Gardening including in it only the cultivation of those crops or flowers likely to be met with in a school garden, or they may produce an elementary textbook on Botany, or they may endeavour to combine the two, introducing some so-called "Nature Study", depending on their ideas of the position of gardening in the curriculum of the school.

One of the dangerous tendencies of the time in the Public Elementary Schools is towards the division of the instruction given into a number of distinct Subjects, which are kept entirely separate from each other. The School Time-Table is, by this means, overburdened with a number of "Special Subjects", each of which is in itself desirable, but which collectively form a mass that no child can assimilate. And so, instead of education being improved and character being formed, there is produced a helpless individual whose initiative has been crushed out of existence and whose brain has been dulled by the mechanical way in which he or she has been drilled in this multiplicity of subjects.

If Inspectors, both of the Board of Education and of the Local Education Authorities, when visiting schools and advising, would insist more fully than they seem to do that true education is not the instruction of the young in the three R's, in History, Geography, English, Composition, Freehand and Freearm Drawing, in Mensuration, Hygiene, Nature Study, Physical Exercises, in Art, Woodwork, Cookery, Needlework, and in the numberless other subjects possible, but that it consists in the training of the intelligence, in teaching accuracy, system, and method, in making the eye, ear, and hand work together, in cultivating the memory, and the appreciation of beauty in forming character; if teachers when preparing the School Time-Tables and Syllabus would endeavour to co-ordinate and group the numberless subjects, not merely asking themselves how many hours must be devoted to this subject or to that, but how, by grouping, they may reduce the number of the educational compartments, into which the child's school life is divided, and yet make sure that each child receives the maximum of information possible in the best educational manner—then Primary Education will be, what the Board of Education is desirous that it should be, the developing of a healthy mind in a sound body, the preparing and fitting the boys and girls to fill their stations in life, to become Citizens of the Empire, to the advantage of themselves and of the world at large.

It is often said that Life is not as happy as it was, that Education spells discontent. This is to a certain extent true. An 'Education' so-called, which unfits the recipient for his future calling, is not a blessing; but such is not true Education. Tax- and ratepayers who declare that millions of pounds are yearly being thrown away in England on what is not wanted in education are not far wrong, but money spent on true Education is the best investment possible.

From the experience gained during a number of years' work in school gardens, and as a result of very many searching inquiries of teachers and parents, we have been convinced that School Gardening and Nature Study, when properly co-ordinated with the rest of the work in a school, can be, and often is, a most valuable means of education. It instils into the minds of the children methodical reasoning, adaptability, and resource; it cultivates the love of the beautiful; it improves the powers of observation and creates a feeling of good comradeship. Gardening, moreover, gives a zest to the school life, and has been proved to improve the physique of the children allowed to take part in it. To rank, however, as a subject for education and not merely as one for instruction, it is essential that the gardening is not considered as the one outdoor subject independent of all the others—it must be woven into the Scheme of the School. Arithmetic and Composition lessons can deal with the actual work of, and the results obtained from, the school garden. History, Geography, and Physiography, can be illustrated by its means. Freearm and Freehand Drawing, Brushwork, &c., can all benefit from and assist in recording the work in the garden, &c. If the garden is thus employed as a link between the different subjects now taught in the schools its effect must be, and has already proved to be, beneficial to the true education of the individual scholars and to the school as a whole.

It is absolutely essential, however, that the teacher should be an enthusiast himself. Without his keenness the stimulus which the subject can give is not felt, and as a subject it had better not be added to the already overburdened curriculum. Where this keenness exists there the effect of the school garden on the work of the whole school is most marked. The standard reached in every subject seems raised, the intelligence, memory, and artistic feeling of the children improving with the increase in the powers of observation and reason.

It is with these objects in view that this book is written. Suggestions from existing school gardens are made, but they are suggestions and not definite directions. The reasons are given for the different suggestions, but in many cases in our own experience school gardens, which seem to resemble one another in almost every particular, are best treated in very diverse methods.

The keen teacher who is "running" a school garden is always anxious to discuss his garden and methods with other teachers, and this interchange of views is of enormous advantage to all concerned.

Boys ready for Work.

Boys at Work.

CHAPTER I

THE GARDEN

Situation. Although it is not always possible to select the ideal spot for the garden, yet it is worth while, if more than one site is available, to know what points should be considered in making a selection.

First of all the garden should be near the school, since much time is saved both to the teacher and to the boys in going from the school to the garden. Moreover, in schools which have not a large staff of teachers, it is often possible, if the outdoor gardening lesson can be given close to the school, to have a school garden, which would otherwise be impossible without an addition to the staff, since the teacher is at hand if his presence in the school is required. The school garden should be a daily object-lesson to the whole school and not merely to the boys cultivating it. There is a risk in many places of the produce grown being stolen; if the garden is near the school the children themselves will act as most efficient caretakers. Yet another reason is that in showery weather the boys cultivating the garden can take shelter readily, and the crops are under daily observation by the boys, who weed them in a very short time without the personal supervision of the teacher being required.

The garden should not be low-lying or on very high ground, since many low-lying gardens are subject to the bad effects of fogs and late spring frosts, and may even be waterlogged. On high exposed positions winds and gales may do much damage.

It is desirable that the garden should have a south,

south-east, or south-west aspect, because if facing north or north-east the garden will be exposed to cold biting winds, and will get less sunshine. A garden sloping in the right direction has undoubtedly an advantage over one sloping the wrong way, since not only does it get more of the life-giving sunlight, but its crops are sheltered from the cutting winds and so ripen earlier. A garden on a slope is better than if quite level; but the slope should not be so steep as to make gardening operations difficult, or for the surface-soil at the top of the slope to be in danger of being washed down to the bottom in heavy rains or floods. One to two inches to a yard would not be too much. An advantage of the slope is that the boys can get on to the land much quicker after heavy rains than they could on to land from which the water could not run away but must soak away.

Size. The garden should not be so large as to be unmanageable or so small as to be useless.

If the boys are each given a plot (the individual plot system), not less than one pole should be allowed for each boy.

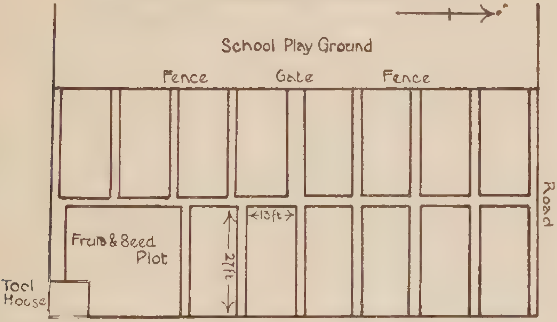
If two boys, a junior and a senior, work a plot together (the two-boys plot system), not less than two poles should be allowed for each plot.

If the boys work together on one common garden-plot, the garden should be large enough to provide one and a half poles for each boy, since if less land than this is allowed the boys get in each other's way, and much time is wasted.

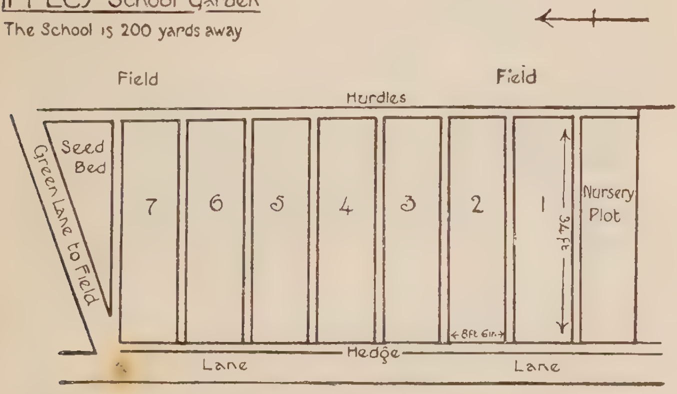
In any case it is advisable to have in addition a plot in common for seed-beds, rose-briers, apple- and pear-stocks, &c.

Shape. In marking out the plots in a school garden considerable care should be exercised to get the best arrangement possible. As far as possible the plots should be of the same shape and they should have equally good situation and soil.

There is a decided advantage in having the plots oblong rather than square. The accompanying plans, those of actual school gardens in Oxfordshire, may be of interest as showing how gardens varying in size and shape have been laid out in plots.

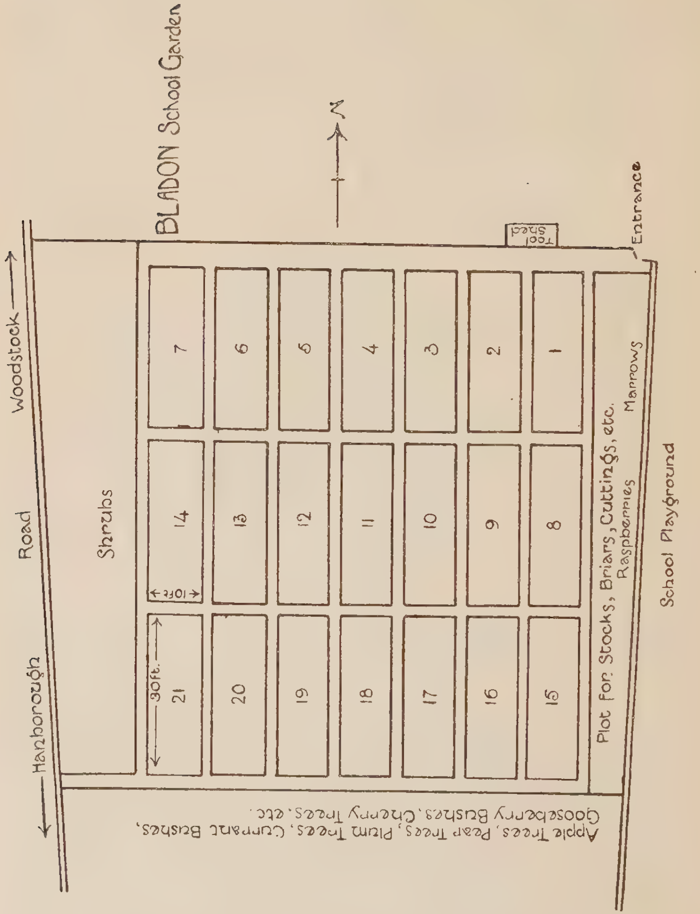


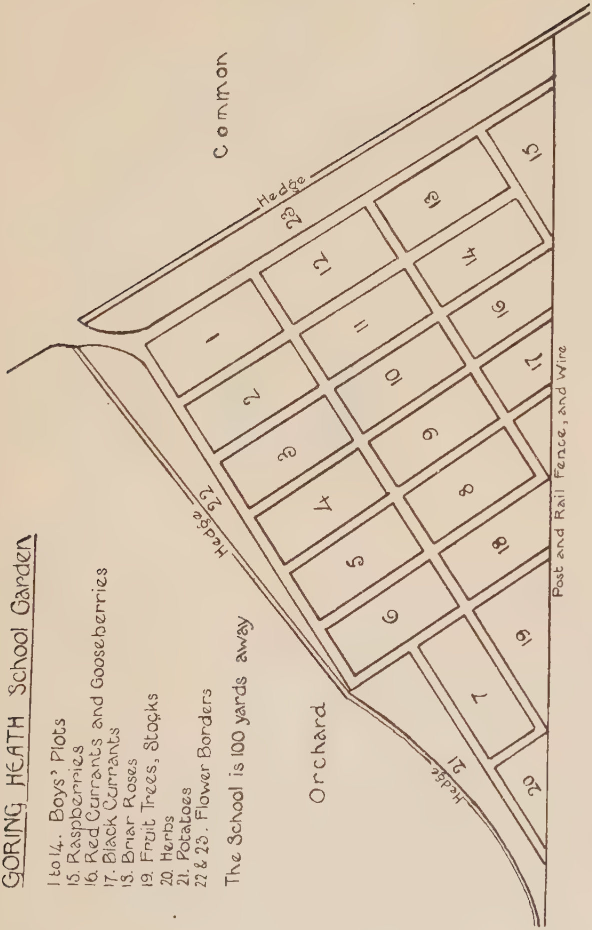
CAVERSHAM St. John's School Garden.



IFFLEY School Garden

The School is 200 yards away


BLADON School Garden
N
Woodstock Road
Hanborough
Shrubs
Tool Shed
Entrance
7
6
5
4
3
2
1
14
13
12
11
10
9
8
21
20
19
18
17
16
15
10 ft.
30 ft.
Plot for Stocks, Briars, Cuttings, etc.
Raspberries
Marrows
School Playground
Apple Trees, Pear Trees, Plum Trees, Currant Bushes,
Gooseberry Bushes, Cherry Trees, etc.


GORING HEATH School Garden
1 to 14. Boys' Plots
15. Raspberries
16. Red Currants and Gooseberries
17. Black Currants
18. Briar Roses
19. Fruit Trees, Stocks
20. Herbs
21. Potatoes
22 & 23. Flower Borders
The School is 100 yards away
Common
Orchard
Hedge
Hedge
Hedge
Post and Rail Fence, and Wire
1
2
3
4
5
6
7
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10
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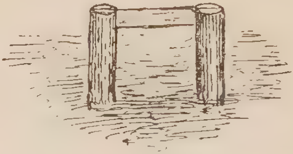
23

Paths. The main paths between the plots should be about 3 feet wide and the others 15 inches: if narrower it will be found that barrows are not easily trundled by the boys. These paths should be made as dry as possible by digging out the soil to a depth of 9 inches and putting rough broken stones, bricks and clinkers to a depth of 6 inches and then covering the whole with fine gravel, sand, or sifted ashes, 3 inches deep.

The centre of the paths should be a little higher than the sides. Constant rolling will quickly form a solid surface. In "clay" counties where stones are scarce, burnt clay is the best and cheapest path-making material.



Foot-scraper.

If great economy is not necessary the plots can be finished with edging tiles or boards, but this will cost for material about 1*d*. or 2*d*. per foot run or nearly 7*s*. a plot.

Each plot should be provided with a foot-scraper, which can be easily made by the boys themselves from barrel hoops and pieces of wood.

Draining. Before laying out the plots and making the paths, or trenching and manuring the ground, one must decide whether the land requires draining. For the successful cultivation of garden crops the ground must be sufficiently drained to carry away all superfluous water quickly, since the roots of plants require not only heat and moisture, but also air. Moreover, without air the organic matter in the soil cannot be converted into the necessary plant food. Stagnant water in the soil lowers the temperature, excludes the atmospheric air, and generally renders the working of a garden unsatisfactory.

Observation will enable any one to quickly determine whether the soil is waterlogged. The kind and condition of the herbage growing on the land gives the first indication, the second is given by the depth from the surface at which water stands in the soil, the third by the nature or condition of the soil when trodden on.

On undrained and boggy land plants of the following kinds will be found: Rushes, Marsh Marigold (*Caltha palustris*), Great Spear-wort (*Ranunculus Lingua*), Common Flag; in extreme cases Sedges (Carnation Grass), Tufted Grass (*Aira cœspitosa*), &c., and the herbage, instead of being a vigorous green, will appear of a sickly yellow colour.

If test-holes are dug and it is found that the water stands within 3 feet of the surface, drainage is advisable.

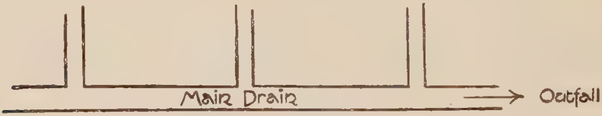
If when walking on the land the ground is spongy and soft and the water oozes out at each step, drainage will be necessary, but do not overdrain. The soil must contain a certain amount of moisture. The depth and distance apart of the drains will depend upon the nature of the soil and the " fall " of the ground. The greater the slope of the ground the fewer the drains required, and the greater the distance they should be apart. Heavy retentive clays require more drains, and these placed nearer the surface, than in the case of lighter or loamy soils. The distance apart of drains will vary from 15 to 35 feet, and the depth from 3 to 5 feet.

Garden drains should be sufficiently deep to be out of danger when trenching is going on.

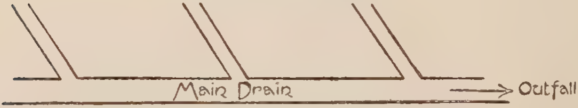
Before beginning operations first take the levels and measure the ground and draw a plan of the site to scale, showing the positions of the main and lateral drains. Always drain to the lowest part of the garden into a receptacle with an overflow; an old barrel or two sunk in the ground is quite satisfactory. The drainage water thus saved is of great value in a hot dry summer.

The boys should assist in this drainage work, not only in the digging, but also in the survey work.

It is usually unsafe to trust to the general appearance of the land when levelling, since the slopes of adjoining land and of the hills in the neighbourhood may deceive the eye. In one case in our knowledge an experienced man, trusting to his eyes alone, laid his drains so that the outlet of the main drain was actually 9 inches above the inlet of the furthest lateral drain, instead of being 2 feet 6 inches below it, as he had intended. Of course the whole of the expense incurred in this drainage was entirely wasted.



This shows how lateral drains should not be connected with the main drain.

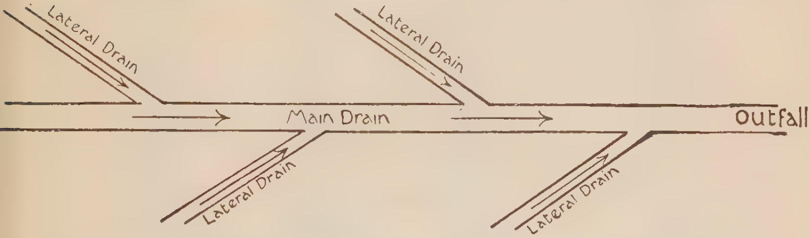


This shows how lateral drains should be connected with the main drain.

The main drains should be a few inches lower than the lateral drains and should have pipes 4 inches in diameter. The lateral or side drains should not connect with the mains at right angles, but should enter the mains in the direction of the flow, so as to avoid chance of blockage.

If the lateral drains enter the main drain on both sides they should not be connected opposite each other, but the entrances should be some distance apart as in diagram.

Pipes 2 inches in diameter are large enough for the side drains and, like the main drains, should be laid with great care, since if disturbed when putting back the earth they will become choked and much of the labour and money spent will be wasted.



Showing how lateral drains on both sides of a main drain should be connected with the main drain.

The tools used in this drainage work are :—

(1) *The Graft.* This is a spade with a curved blade 12 to 14 inches in length, and in width 5¾ to 6¾ inches. The blade should be of solid steel, fitted with a D or crutch handle of ash. (Figure 5, page 25.)

(2) *The Draining-tool* is also a spade, with a straight blade 16 to 20 inches in length, 6 inches wide at the top, and tapering down to 3 or 4 inches at the bottom. This solid steel blade should be strapped or socketed into a D or crutch ash handle. (Figure 2, page 25.)

(3) *The Draining-scoop*, to clear out the bottom of the drain after it has been shaped by the draining-tool. It is made of forged steel ; the length is 14 inches and the width 2½ to 3½ inches. (Figure 5, page 27.)

(4) *The Pipe-layer*, consisting of a 5 feet long handle with a pointed steel bar set at right angles at the end of the handle. This bar is 12 inches long, and is used for threading into the pipes for lifting them and laying them into place, so that the ends of the pipes press against one another and fit level.

(5) *The Level.* An ordinary spirit-level. (Figure 1, page 27.)

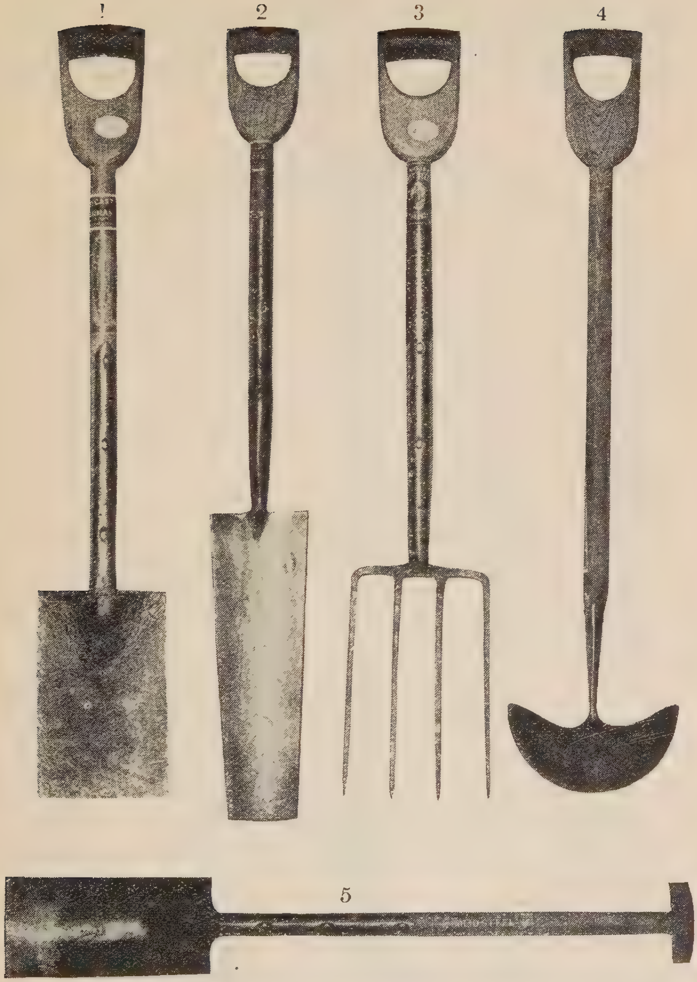
When the site has been selected, drained, and marked out into plots, it is necessary to consider what tools are required by the boys.

CHAPTER II

TOOLS

In practice we have found that the following tools are ample for a class of fourteen boys if the work is systematically arranged :—

(1) 7 Spades. (Figure 1, page 25.)
(2) 7 Forks. (Figure 3, page 25.)
(3) 5 Rakes in sizes. (Figure 4, page 27.)
(4) 4 Dutch hoes. (Figure 6, page 27.)
(5) 4 Draw hoes. (Figure 3, page 27.)
(6) 4 Trowels. (Figure 1, page 29.)
(7) 4 Hand forks. (Figure 4, page 29.)
(8) 1 pair of secateurs. (Figure 6, page 29.)
(9) 4 Pruning knives. (Figure 8, page 29.)
(10) 4 Budding knives. (Figure 7, page 29.)
(11) 1 Garden line and reel. (Figure 2, page 29.)
(12) 1 Rain-gauge and funnel. (Figures 1 and 2, page 33.)
(13) 1 Maximum and minimum thermometer, with magnet. (Figures 3 and 4, page 33.)



1. Spade. 2. Draining-tool. 3. Fork. 4. Edging knife. 5. Graft.

(14) 1 Wheelbarrow. (Page 31.)
(15) 2 Besoms or birch brooms. (Figure 3, page 29.)
(16) 2 Two-gallon watering-pots. (Page 31.)
(17) 1 Syringe. (Figure 7, page 33.)
(18) 2 Dibbers. (Figure 9, page 29.)
(19) Labels. (Figure 5, page 29.)
(20) Hand saw. (Figure 5, page 33.)

A brief description of the individual tools may be useful.

(21) *Pick.* This is a tool which, though not often necessary, is at times useful. The handle should be of sound ash or hickory and the head of the best iron pointed with steel. For general work we have found the kind with the head pointed at one end and wedge-shaped at the other end very useful. This is a dangerous tool in the hands of boys, and should only be employed under personal supervision. (Figure 2, page 27.)

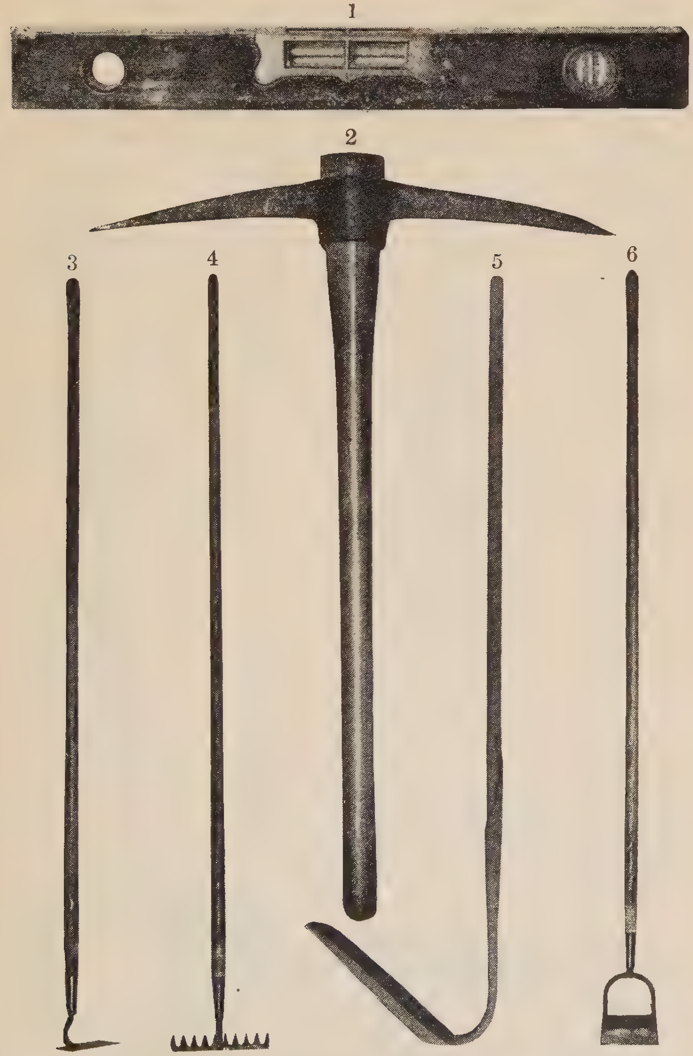
If used by the boys themselves the tool should be light.

Spades. The blade should be about 6½ inches wide and 10½ inches long, and should be of solid cast steel throughout, with a tread and a 11½-inch strap riveted into the handle. The handle must be of ash and the top D-shaped, with riveted eye. The total weight must not exceed 4½ lb. Such a tool is light, strong, and durable.

Forks. Each fork supplied should be a strong four-tine fork of solid cast steel, with the tines 12 inches long and at top $\frac{3}{8}$ by $\frac{7}{16}$ of an inch thick, and with a strap riveted into the handle, which should in all respects be like the spade handle. The weight of the fork should be about 4 lb.

Rakes. Sizes of 8, 10, and 12 teeth will be required. The teeth should be oval in shape, 2½ inches long, and the head and teeth of solid forged steel, fitted with a tang which is driven into an ash handle fitted with a steel socket.

Hoes. The draw hoes should have blades of 5 to 6 inches in width and 2½ to 3 inches in depth, made of



1. Spirit-level. 2. Pick. 3. Draw hoe. 4. Rake. 5. Draining-scoop. 6. Dutch hoe.

solid steel. The blades, attached to the steel sockets by D-shaped eyes, should be inclined at an angle of about 60 degrees.

As these hoes are required for boys it will be necessary that the angle the blade makes with the handle be more acute than is usually the case, since a boy's hands are nearer the ground than a man's.

Dutch or Push-hoes should have a solid blade with welded hoop fitted to an ash handle. The size may vary from 4 to 6 inches long in the blade.

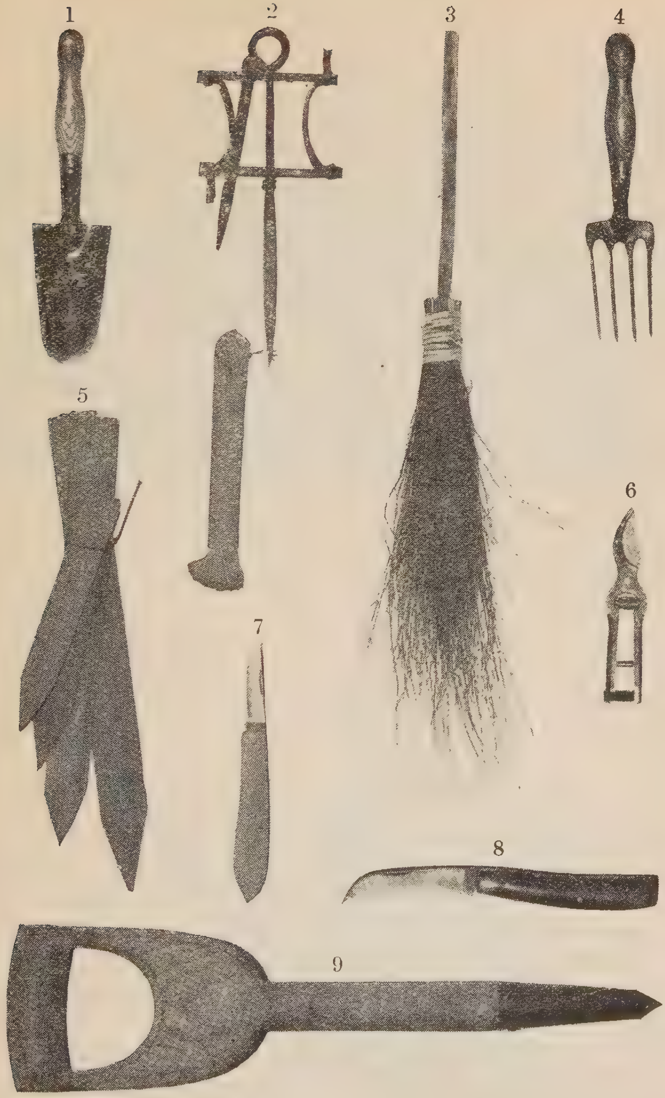
Trowels. A trowel with a semi-cylindrical blade 6 inches long, fitted into an ash handle, will be found to be a useful tool.

Hand fork. A four-tined flat-tongued steel fork, with a solid steel socket into which an ash handle fits, with the tines 5 inches long, is a companion to the trowel very useful for lifting and transplanting plants.

Dibber. The top of a spade-handle roughly pointed makes a suitable and handy tool for putting out plants.

Secateurs. When fruit trees are cultivated a pair of good secateurs should be provided. This tool consists of a pair of scissors or shears with curved blades and longish shanks. The blades should be about 2 inches and the shanks about 8 inches in length. The secateurs are opened by a spring between the shanks. The curved blades enable a branch to be gripped and cut through, where if the blades were straight the branch would slip away when the shanks were pressed together.

Hand saw. A folding hand saw is necessary, where many and large fruit trees are cultivated, to cut through branches which are too large for the secateurs. The teeth of this saw should be very wide apart, since the green and sappy wood it has to cut would quickly clog the teeth of an ordinary saw. The saw-blade should fold into the handle like the blade of a pocket penknife, but round the



1. Hand trowel. 2. Garden line and reel. 3. Besom or birch broom. 4. Hand fork. 5. Labels. 6. Secateurs. 7. Budding knife. 8. Pruning knife. 9. Dibber.

handle there must be a revolving ferrule to hold the blade firm and rigid when the saw is open for use.

Pruning and Budding knives. Where boys are taught pruning, grafting, and budding a good strong pruning knife with a 3-inch slightly curved blade, and a budding knife should be provided for every three or four boys. More are not necessary.

Measure rod. A sliding measure rod, or sticks marked off in inches, will be necessary to measure the distance apart of rows.

A *garden line* is necessary. The line should be wound up and taken under cover when not in use. Two strong-pointed pegs and a piece of clothes-line or strong string will do well.

Most gardens will also require a watering-pot, a wheelbarrow, and a besom. These, as they are for the use of boys, should not be too large or heavy.

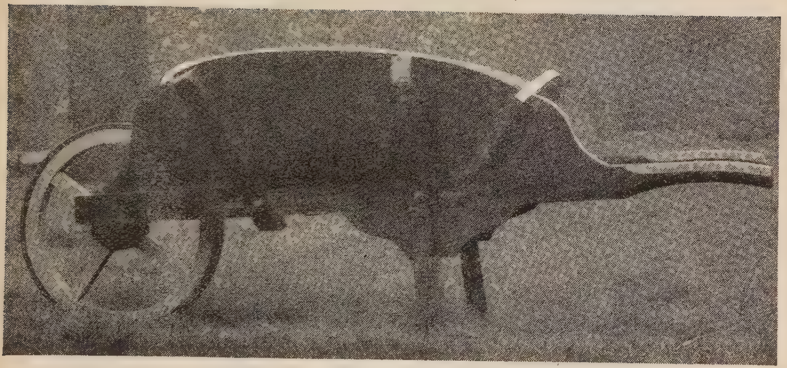
Since school gardening is intended to be of educational value, and not merely instruction in gardening, the boys should be taught to make daily observations concerning the weather, and these meteorological records should be kept and compared month by month and year by year.

There should, therefore, be supplied at least a rain-gauge and a maximum and minimum thermometer.

The rain-gauge ought to be of the very simplest description. We use merely a glass funnel and a simple flat-bottomed glass bottle. The diameter of the funnel is 6 inches. The boys are required to calculate the area that the funnel covers, first of all by the help of squared paper, then by regular mathematical formulae.

The rain collected in the bottle is poured into an ordinary cylinder graduated in cubic centimetres.

The boys are required to reduce the cubic centimetres to cubic inches.



Wheelbarrow.

Watering-pot.

As it seems that these calculations cause considerable difficulty the following may prove helpful:—

The area of a funnel 6 inches across is about 28⅓ square inches.

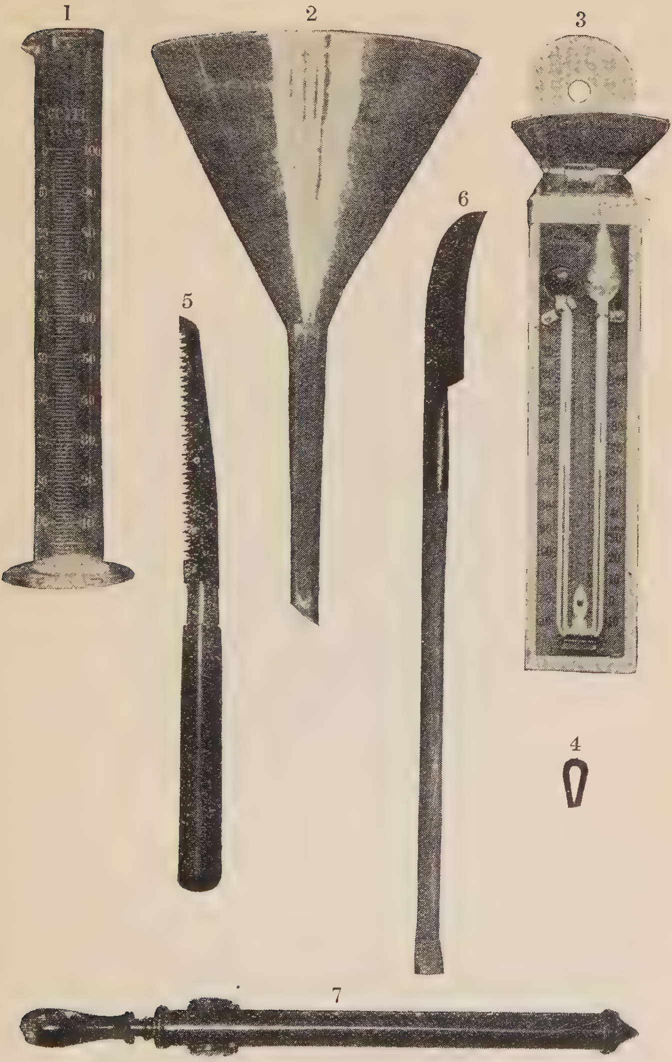
One cubic inch contains 16·38 cubic centimetres. If, therefore, a 6-inch funnel is used and the number of cubic centimetres of rain measured are divided by 463½ the number that is obtained is the rainfall in inches.

$$\text{Since rainfall in inches} = \frac{\text{Cubic inches of water collected}}{\text{Area of collecting vessel in square inches}}$$

$$= \frac{\dfrac{\text{Cubic centimetres}}{28{\cdot}286}}{\pi \times \frac{1}{4} \times 6 \times 6}$$

The whole of the tools for the school garden (excluding the draining tools) should not cost more than £7 10*s*. 0*d*.; for small gardens it only averaged in Oxfordshire £3 0*s*. 0*d*. This was in 1909.

Now (1920), the whole of the tools for the School Garden (excluding the draining tools) costs from £15 to £20.



1. Rain-gauge. 2. Glass funnel. 3. Thermometer. 4. Magnet. 5. Hand saw. 6. Hedging knife or slasher. 7. Syringe.

CHAPTER III

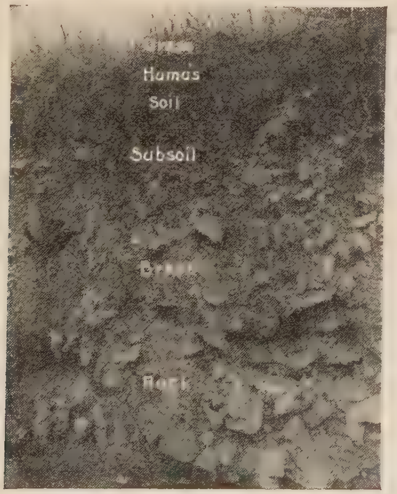
PREPARATION OF THE SOIL

After draining, laying out the plots, and making the paths, comes the preparation of the soil for the crops. The earlier in the winter this can be done the better.

The soil is really the storehouse of part of the plants' food, and must be made sweet, and the food must be present in sufficient quantity and in the right condition for the requirements of all crops. How are we to get such a soil? There is only one way. *We must make it*, and all gardening operations aim at this. These operations first of all break up the soil so as (1) to sweeten it by allowing air to enter it, (2) to bring fresh plant food within the reach of the future crop, (3) to make it possible for the tender root tips of the growing plants to force their way through the soil. They then provide the plant food either by allowing the plant to get at the food already existing in the ground, or by adding fresh food, or manuring the ground. The question we must put to ourselves is, then, What have we to start with? What is the soil and where has it come from? How may it be rendered most valuable for the crops we wish to grow?

If we examine the sides of a railway cutting, a pit, or a well dug in a piece of land which has not been disturbed by artificial means, as, for example, in an old pasture, we find various layers, and these layers always occur in the same order, no matter what kind of soil it is or in what part of the world. Sometimes one or more of these layers may be missing.

On the top there is a grass or vegetable layer about 3 inches thick. Below this comes the soil proper, from a few inches to over a foot in depth. Under the soil comes the subsoil, which may be wanting altogether or which may reach to a very great depth. Below the subsoil in most cases comes the rubble or brash, which is composed of a mixture of broken rock and subsoil; lowest of all is the solid rock. The turf varies in colour, but is usually black or yellow. The soil is lighter in colour, but is usually darker than the subsoil. There is a very large number of rocks of different kinds, and from these the soils over them take their characteristic properties, as might be expected, since the bulk of the soil is derived from the underlying rock, the rest of the soil being due to materials washed down on to the rock and to vegetable matter.



Section showing Layers.

These layers vary in thickness, and, as above mentioned, some may be absent altogether; for example, in a hilly district the rock may reach the surface, or the turf and soil may rest directly on the rock, the subsoil and rubble being absent.

The term "rock" is applied in geology to every solid substance composing the crust of the earth, so "clay" is called a rock in this sense.

Having seen how the soil is derived, it is now desirable to know what are its components.

On examining any soil with a magnifying glass, or even by the eye alone, it is found that in most cases various different materials can be distinguished. There are five different materials which must be present in all fertile soils: they are stones, sand, clay, lime, and humus, and soils are classed as one or more of these materials predominate.

These definitions are not to be regarded as doing more than roughly indicating what the usual terms mean.

A sandy soil contains over 90 per cent. sand.
A sandy loam contains from 80 to 90 per cent. sand.
A loam contains from 70 to 80 per cent. sand.
A clayey loam contains from 30 to 50 per cent. clay.
A clay soil contains over 50 per cent. clay.
A marly soil contains from 5 to 20 per cent. lime.
A calcareous soil contains over 20 per cent. lime.
A humus soil contains over 5 per cent. organic matter.

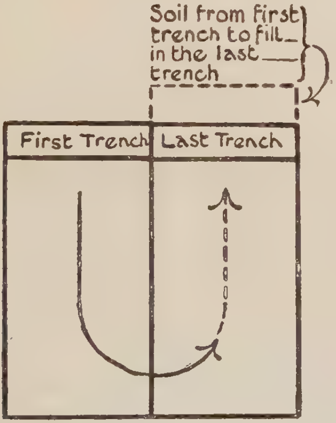
Stones are generally fragments of the original ground rock, and constitute a source for the production of deeper soil as they get broken up by the action of frost and rain. Moreover, as they usually contain some of the essential plant foods, their breaking up, or "weathering", continually helps to enrich the soil.

Sand (Silica or Quartz) renders the soil loose and friable.

Clay (Hydrated Aluminium Silicate), on the other hand, renders the soil heavy, stiff, and difficult to work. The particles of clay are too small to be distinguished without a microscope, and, owing to their small size and plastic character, enable the soil to retain moisture.

Lime usually exists in soils as Calcium Carbonate. Every fertile soil must contain some, if only a small percentage; if 5 per cent. only is present it becomes visible and gives a marl. It resembles sand in its effect on the physical character of a soil, rendering a stiff soil more friable.

Humus is the name given to the matter of organic origin which accumulates in the soil. It is the body which renders the turf and soil darker in colour than the subsoil.



How to prepare for Digging.

Gardening operations, then, are intended to reduce the soil to as fine a state of division as possible, to increase the depth of the soil, and to provide for the plants the necessary plant foods.

In a garden the first operations for "making" the soil are—(1) draining, if necessary; (2) digging; (3) trenching; and (4) manuring.

Attention has already been drawn to the advantages of properly-drained land, and the methods to be followed have been set out.

As to *Digging*. Begin at the lowest part of the garden and open out a trench *twelve* inches wide, and put the soil where you will finish. If the site is fairly wide it will save labour to divide it in half, as it is then only necessary to move the soil from the first-made trench a short distance.

Each Boy with a heap of Manure on his Plot.

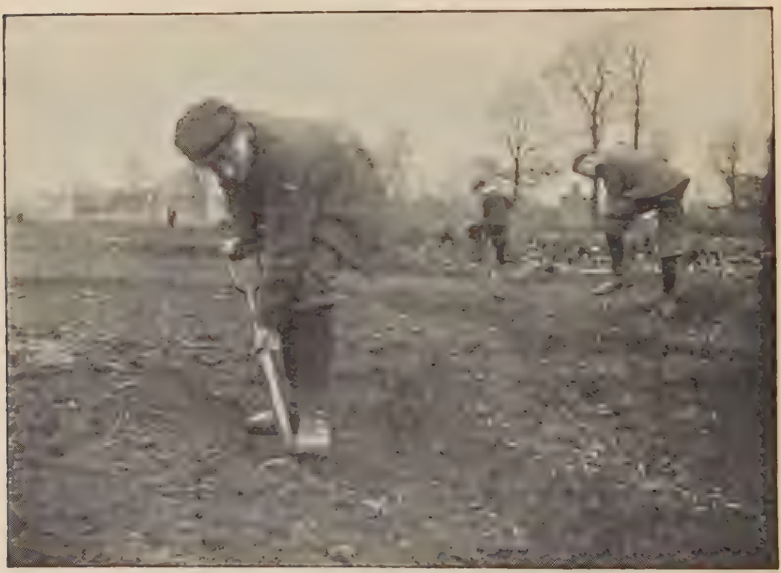
When digging, put the spade or fork well into the ground in an upright, not slanting, position, and having made a good open trench right across the piece and as deep as the blade of the spade (known as a "spit"), then dig a second trench parallel to the first, turning the soil well over and placing it in the first trench. If the soil is heavy and retentive dig in plenty of new stable manure (long manure). One ton to 10 poles of ground is a good dressing, and a quantity of quicklime, which has been allowed to become "slaked" and reduced to a fine powder in the open air, 14 lb. to 28 lb. per pole of ground, can either be mixed with the soil and manure at the time of digging, or it can be thrown on to the soil afterwards. The approximate cost of digging is 6*d.* per pole.

After the Manure is spread—Boys ready for digging it in.

Trenching, or deep digging, two spits deep or more, has many advantages where it can be done. Some soils are shallow with rock directly underneath which it would be difficult and expensive to move; other soils have a sour subsoil which would certainly be much benefited if exposed to the air, yet it would be foolish and absurd to bring this to the top and place the surface soil at the bottom.

The lower "spit" of such sour soils may be stirred with the fork and left, as in bastard trenching described below.

Increase the depth of the soil as much as possible and as quickly as possible, but it must be done in a common-sense way, by degrees. First digging, then bastard trenching, followed by trenching proper.



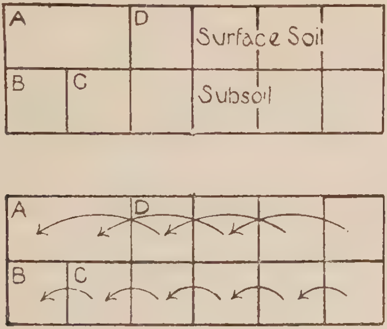
1 2

1. Tool slanting too much. 2. Tool being driven straight down. Correct.

The orthodox way of trenching is to open out a trench one spit deep and 4 feet wide, A to D, and to place this surface soil conveniently for filling up the last trench. Then half this width, B (2 feet), is dug out another spit deep. The earth in this deeper spit will probably be different in mechanical and chemical composition and in colour from the top spit and should be placed near the surface soil for filling in the bottom half of the last trench.

The sketch will explain the operation more clearly than words can describe it.

Now turn over the bottom of the first trench, B, which is already two spits deep, add a good dressing of animal and garden refuse and roadside quarterings with a sprinkling of lime on the top. Then turn on to this the subsoil of the second half of the first trench, C, to which can be added both organic and inorganic manures according to the nature and composition of the soil. This trench should be filled up with the top spit of the next trench, D, keeping each trench 2 feet wide until the work is done.



How trenching should be done.

Bastard trenching is moving the top spit and turning over the second spit or subsoil without taking it out of the trench.

Heavy soils should have materials added which will lighten them and make them more porous, friable, and workable.

Light soils should have materials added which will make them more absorptive and retentive.

Ridging or roughing up of ground in winter is extremely valuable, but is usually greatly neglected. As water on freezing expands, the tiny cracks which are in the stones and soil filled with water are forced open, and the soil is thus broken up into a very fine state of division eminently suitable for cultivation. Ashes from coal should not be dug into any soil, since they are of no mechanical or nutritive value.

Manures for the Garden

Mention has been made of the food requisite for plants, but no reference has been made to what this food is.

Plants, like animals, need oxygen, which is obtainable from the air; but oxygen cannot be considered as a food. Plants, unlike animals, do obtain their chief food from the air; it is carbonic acid. This and the water obtained by the roots from the soil forms more than 99 per cent. of the weight of a plant. The carbonic acid is absorbed from the air by the green leaves. If a plant has its leaves destroyed it cannot grow properly, although by drawing on the reserve food it has stored up it can live for some time.

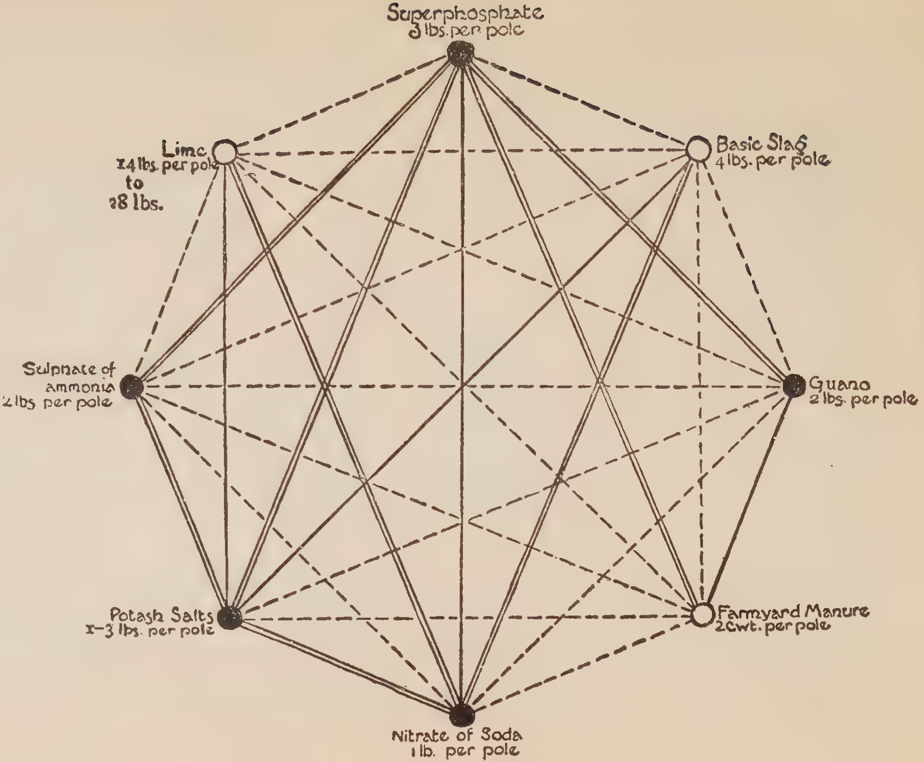
As, however, there is an ample supply of carbonic acid in the air, it is not necessary to consider how to increase its amount. There are, however, a number of chemical substances which must be supplied to the plant for it to grow. Ordinary soil contains most of them in abundance, but there are five which may be exhausted, some in one district, others in another. These five are—Water, Nitrates, Phosphates, Potash, and Lime, and in cases where any one of these is absent no crop will grow properly.

It is necessary in the cultivation of a garden to use on all available occasions materials which will improve the mechanical texture and condition of the soil, and which will add these fertilizing plant foods in varying degrees of solubility, to meet the demands of the growing crops. Just as it is impossible to feed a human being by one gigantic meal once a month, so to feed a plant the food must be brought to it as it wants it, not all at once. The plant obtains the necessary food through its rootlets, which suck up water with the plant food dissolved in it. If the roots are deprived of water they are unable to obtain the food, and the plant is starved and withers. If there is too much water, the plant has to drink up too much for the leaves to get rid of to get enough food, so the plant is sickly and does not thrive. Phosphates are usually present in soil as calcium phosphate, but this hardly dissolves in water unless an acid is present. The tips of the roots produce an acid which helps to render the phosphate available as food. The Nitrates are produced in all good well-aerated soils by the decay of organic matter, but when once formed are immediately dissolved, and are washed away unless the plants can get them, or unless capillary attraction prevents the water from escaping. Potash is usually present owing to the "weathering" of the rocks, but it is often present in an insoluble form, and therefore unavailable for the plant; but the breaking up of the rocks and the exposure of the broken rock to the action of carbonic acid and water, gradually converts the insoluble forms into soluble plant food.

Lime is only needed in small quantities by the plants, but unless present the organic matter in the soil decaying produces acids which are injurious to plant life. If present the lime combines with these acids and renders them harmless. It is therefore necessary to add lime to soils in which it is absent. Its presence is also beneficial to the bacteria which destroy the organic matter, converting part of it into the valuable nitrates.

Combined Nitrogen, in the form of nitrates, is absolutely necessary for plant life, and this is the constituent which is often lacking in a soil. It is undesirable to add at once all the nitrate wanted by the plant, partly because Chili Saltpetre or Sodium Nitrate, which is the usual form in which this combined or "nitrate" nitrogen is added, stimulates the plant-growth too rapidly, producing rank growth, but also, as the sodium nitrate is very soluble in water, the rain will wash a large proportion out of the soil before the plant can use it, and, as it is an expensive manure, the loss would be considerable. There is in all fertile soils a bacillus (*Nitrosomonas*) which has the power of converting ammonia and the ammonium salts into nitrites, and another (*Nitrobacter*) which in its turn can convert nitrites into nitrates. It is possible, then, to add to the soil combined nitrogen as an ammonium salt (ammonium sulphate, which is a by-product in the manufacture of coal gas). This, although very soluble in water, is not easily washed away, because the clay in the soil has the property of retaining or holding the ammonia, and this is gradually converted into nitrite and nitrate ready for the plant's needs. Still, the addition of sulphate of ammonia in large quantities is undesirable, since it "burns" the plants as do other very soluble manures. Animal and vegetable matter, when decaying, have their nitrogen converted into ammonia, which is then converted into nitric acid and calcium nitrate; as mentioned before, this forms the main source of the nitrogen which plants require, although the Leguminosae can, by the assistance of yet another bacillus (*Pseudomonas radicicola*), actually obtain the necessary nitrogen directly from the air.

Iron, silica, &c., are also requisite for plant life, but these substances are always present in soil in far larger quantities than is necessary for the plant.



A. Manures connected by a dotted line should not be mixed. *B.* Manures connected by a single line should be used immediately after mixing. *C.* Manures connected by a double line can be mixed and used any time. White circles show autumn and winter manuring; black circles spring and summer manuring.

Nitrogen-containing manures promote growth.

Potassium-containing manures stimulate fruit-bud formation, colour, and flavour.

Phosphatic manures increase the food-forming parts of vegetables.

These three manurial substances are, however, required for all plants, and the fertility of a soil depends on the presence of all these. If one is absent the soil will grow very little.

Peas and Beans do not need nitrogenous manures, as they can use the atmospheric nitrogen by the aid of the soil bacteria.

Compost heaps of manure, leaf mould, and vegetable matter generally, when decayed, contain a store of valuable plant foods, and every care should be taken to save this supply of food. For example, as farmyard manure loses its value when it gets too hot and dry, or when so saturated with water that a stream of black liquid runs from the heap, the soluble plant foods should be retained by placing occasional layers of soil some 3 inches thick between the layers of manure, and the top of the heap should be covered with a layer of soil at least 6 inches thick.

It should be realized that chemical manures cannot take the place of farmyard manure entirely; they should be used in conjunction with it. Most of the "artificial or chemical" manures can be used either as a powder or in solution, when ½ oz. to 1 oz. of the manure is stirred up and dissolved in a gallon of rain-water. Light and frequent doses are preferable to few and heavy dressings. In applying the artificial manure to growing crops do not let the powder touch the foliage.

The opposite table shows various kinds of manures, with their valuable plant foods, the variety of soil for which they are most suitable, the time for application, the quantity to apply, and how the application should be made.

Having treated the points to be observed in draining and preparing the school garden, and the tools and manures required, it is now time to consider the crops that can be grown in the school garden.

The plots should be so arranged that the successive sowings in small quantities can be carried out most satisfactorily and easily.

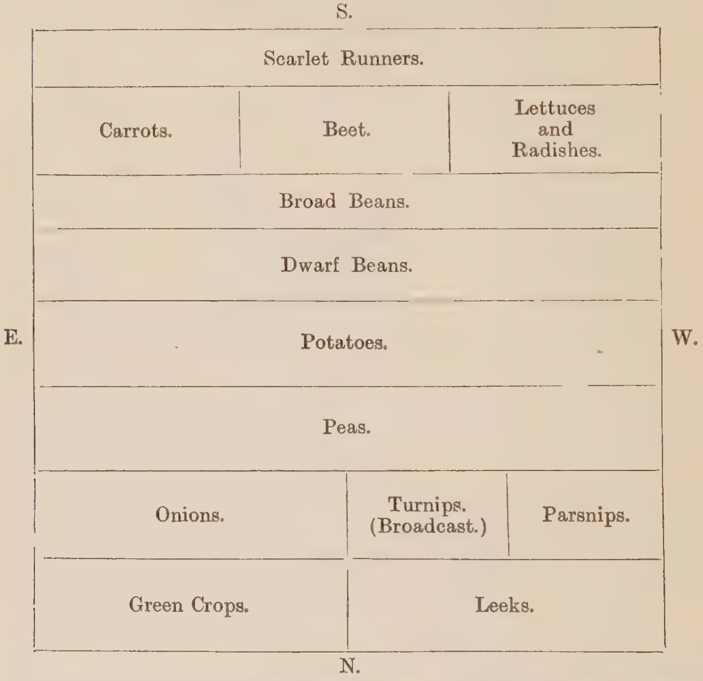
It is found that it is far the best for the crops to run from north to south and from path to path with no "patch" cropping. The following plan will explain briefly the

Kind of manure	*Plant food*	*Soil most suitable*	*Time to apply*	*Quantity to apply*	*Form in which to apply*	*Suitable mixtures*
Nitrate of Soda	Nitrogen	Sandy loam	Spring	1 lb. per pole or $\frac{1}{2}$ oz. to 1 gal. water	Powder or solution	Best applied alone.
Sulphate of Ammonia	,,	Heavy loam	,,	2 lb. per pole or 1 oz. to 1 gal. water	Powder or solution	May be used with Phosphates.
Superphosphate	Phosphates and Lime	General	,,	3 lb. per pole	Powder	May be mixed with Sulphate of Ammonia.
Basic Slag	Lime and Phosphates	Retentive	Autumn	4 ,, ,, ,,	,,	May be mixed with Kainit.
Kainit	Potash	Sandy loam	,,	3 ,, ,, ,,	,,	May be mixed with Basic Slag.
Sulphate of Potash	,,	,, ,,	Spring	1 ,, ,, ,, or $\frac{1}{2}$ oz. to 1 gal. of water	Powder or liquid	Best applied alone or with Superphosphate.
Guano	Nitrogen, Phosphates, and Potash	General	,,	2 lb. per pole or 1 oz. to 1 gal. of water	,, ,,	Best applied alone.
Lime	Calcium	,,	Winter	14 lb. to 28 lb. per pole	Powder	Best applied alone.
Leaves	General	Stony and sandy	Spring	2 cwt. per pole	Decayed	Kainit may be added.
Stable Manure	,,	When new and strawy—heavy	Winter	1$\frac{1}{2}$ cwt. per pole	New	
,, ,,	,,	When decayed—sandy loam	Spring	1$\frac{1}{2}$,, ,, ,,	Decayed	
Nitrate of Potash	Nitrogen and Potash	General	Spring and Summer	1 lb. per pole or $\frac{1}{2}$ oz. to 1 gal. water	Powder or liquid	Best applied alone.
Salt	Chloride of Sodium	Sandy loam	Spring	7 lb. per pole	Powder	,, ,, ,,
Soot	Ammonia	General	,,	6 ,, ,, ,,	,,	,, ,, ,,
Fowl Manure	General	,,	,,	1 bush. per pole	,,	Mixed with sifted soil and dug in.

disadvantages of “ patch ” cropping, and of not arranging the crops systematically, and of not intermixing tall and dwarf-growing crops :—

PLAN A (not to scale).

A School Garden Plot. System of Cropping Bad.

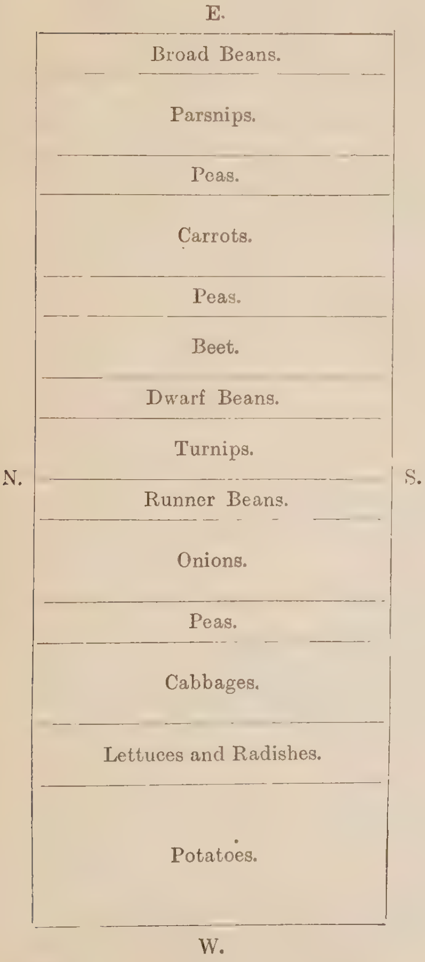


1. Shape of plot wrong because the rows are too long and therefore unsuitable for frequent and successional sowings.
2. Rows run East and West instead of North and South.
3. Scarlet Runners are in a wrong position, and will keep the sun and air from the other crops.
4. Patch cropping of Carrots, Beet, &c., wrong: { Bad for Seed Sowing.
Bad for Cultivation.
Bad for Intercropping.
Bad for Successional Cropping. }
5. Having all the Peas together is a waste of ground and crop.
6. Turnips sown broadcast and between other crops take a longer time to grow, and greatly interfere with the cultural operations.
7. Putting all the Potatoes together is conducive to the potato disease, unless given plenty of room between the rows and sets.
8. The sowing of seed broadcast is wasteful and against good cultivation.

The next plan shows how the crops may be arranged to give good results and make the most use of the land :—

PLAN B (not to scale).

A SCHOOL GARDEN PLOT. SYSTEM OF CROPPING GOOD.



1. Because the shape of plot, long and narrow, is suitable for successional cropping.
2. Because the rows run N. and S.
3. Because the crops are sown in rows. No patch cropping.
4. Peas are sown between dwarf growing crops, and are arranged for succession.

Rotation Crops.

1. Lettuces and Turnips after Peas and Beans.
2. Spring Cabbage after Onions.
3. Turnips for winter use after Spring Cabbage.
4. Cauliflower after Winter Lettuce.
5. Allow sufficient room to plant Winter Greens between Potatoes, or follow Early Potatoes with Brussels Sprouts, &c.

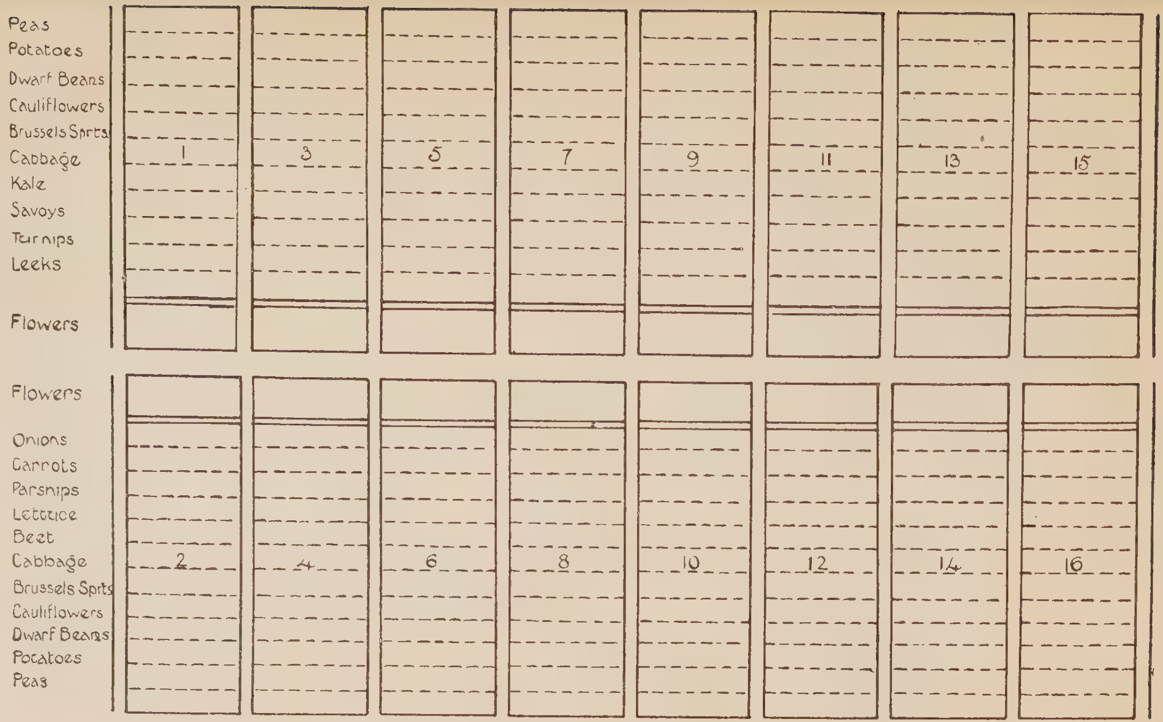
NOTE.—Sow Mustard on vacant ground for green manuring, when it is too late in the season to put in any other crop.

A few years ago it was the general idea that like crops should not be grown on the same piece of land year after year, but since trenching or deep and thorough cultivation is frequently done, and the use of artificial manures has become more common, this idea is gradually dying away. It is now practically certain that on well-cultivated and well-manured land no reason exists why the same kinds of vegetables cannot successfully be grown for many years in succession, provided it is possible to keep the land free from certain pests that affect the crops injuriously. If a piece of land becomes infected with a pest it is necessary either to destroy completely the pest or to grow a crop which is not injured by that particular pest, and by thus depriving it of its natural prey it can be starved and so finally got rid of.

Where, however, it is not possible to cultivate or manure so well, and where insect or fungoid pests are troublesome, it is well to bear in mind the following guiding rules.

It is not advisable to plant or grow on the same piece of land for two or more years in succession:—

1. Plants of the same kind or belonging to the same natural order.
2. Plants of the same habit of growth or having the same part of the plant edible.
3. Plants requiring the same method of cultivation.
4. Plants requiring the same "dominant" foods.
5. Plants subject to the same insects and diseases.



Arrangement of Crops on a School Garden.

CHAPTER IV

SOWING AND PLANTING

HAVING prepared the garden, and having decided the crops to be grown, it is necessary to decide what kind of seeds and what quantities to get.

To assist in this selection a list of the vegetables which have been grown in the school gardens under our personal observation will now be given.

After the names and orders we have placed, in brackets, the names of the countries of which the plant is a supposed native.

Jerusalem Artichoke (*Helianthus tuberosus*). Natural Order *Compositae* (Brazil).

This useful vegetable is only in rare cases suitable for cultivation in a school garden as the stems grow so tall. It is useful, however, to hide unsightly objects and as a shelter for more tender plants from the north and north-east winds.

If, when the plants are from 12 to 18 inches high, the tops are " pinched out " they can be dwarfed.

Plant the tubers in March in rows 3 feet apart, each tuber being 15 inches from its neighbours in the rows, and from 4 to 6 inches deep.

The yield is much improved if the ground is deeply dug and well manured before the tubers are planted.

One gallon of seed tubers (7 ℔.) will plant 60 feet run, and the amount of yield that may be expected is at least 4 bushels (32 gallons). The produce should be worth, approximately, 1*s*. per gallon.

Varieties to grow: "New Pearly White" and "Sutton White".

Broad Beans (*Vicia Faba*). Natural Order *Leguminosae* (Egypt).

Broad beans should be grown in retentive heavily manured soil.

Make successional sowings or plantings from February up to, but not beyond, April. The seed should be planted 3 inches deep in single rows 2 feet apart, the seeds being 4½ inches apart in the row, or they may be planted in double rows, each pair of rows making a double row, being 3 feet apart from the next double row, and the seeds 9 inches apart in and between the rows.

Single row thus:—

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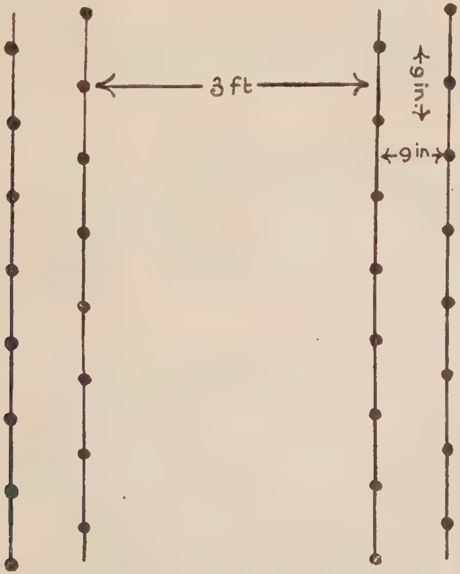
Double row thus:—



Double Rows of Broad Beans.

One pint of seed will plant 60 feet run, and if everything is favourable the yield should be about 1 bushel (36 ℔.); the price obtainable for the produce should be about 6*d.* a gallon. For successional crops "Early Mazagan", or "Dwarf Cluster", "Seville Longpod", and "Green Giant" are suitable.

Keep hoeing between the rows to keep down weeds and to promote rapid growth. If the black aphis appears pinch off the tops affected and burn them. The topping of broad beans increases the size of the pods and beans and hastens maturity. In hot dry seasons a light "mulching" of strawy manure and occasional syringing overhead is always beneficial.

Dwarf Beans (*Phaseolus vulgaris*). Natural Order *Leguminosae* (India).

Dwarf or French Beans should be planted or sown on well and deeply worked soils which have been manured in the winter. A dressing of lime is beneficial to all legumes.

Successional sowings should be made from May 1 to the middle of July. Sow in rows 2 feet apart and from 2 to 3 inches deep. When the plants are well above ground thin them out to 10 or 12 inches apart in the rows. Hoe the ground frequently and well. When the pods are formed a mulching of strawy manure can be given in hot dry seasons.

Periodical syringing overhead will keep the plants free from "red spider" and will promote healthy growth.

Of the many varieties grown and recommended we have not found a better than "Canadian Wonder".

One pint of seed will sow 160 feet run, and the yield in a good season has been 4 bushels (128 ℔.).

The price obtainable would vary according to season and time of gathering, from 3*d.* to 1*s.* per pound.

Plants mature in about twelve weeks; in good seasons we have gathered beans ten weeks after sowing of "Williams's Early Dwarf" and "Ne Plus Ultra" varieties, and we have also gathered from the same plants for ten weeks.

Runner Beans (*Phaseolus multiflorus*). Natural Order *Leguminosae* (S. America).

A rich friable loam dug up roughly in the winter and re-dug in the spring mixed, where the seed is to be planted, with plenty of good well-rotted manure suits runner beans well. The soils suitable for all legumes should be rich in lime and in phosphates. Sow the seed during May and June in rows 12 feet apart, with the seed 9 inches apart if the beans are to be "staked", and a dwarf crop, such as beet, should be grown between the rows. If, however, the beans are to be "pinched" and grown without sticks, then sow in double rows 2 feet apart and 12 inches from seed to seed, planting the seed 3 inches deep.

We have found very little, if any, difference in the total yield from a given area between runner beans staked and not staked, but as the latter matured earlier a better price was obtained for them.

The price of bean rods per bundle of 12 is now 1*s.* to 1*s.* 6*d.*

Hoe, mulch, feed with liquid manure, and syringe the crops freely in dry seasons if you desire good results.

To maintain a continuous supply keep gathering the pods as soon as they are ready, since the ripening of the pods takes all the energy of the plant which otherwise is employed in forming fresh pods.

One pint of seed will plant a 100 feet row, and the yield in a good season should be about 10 bushels.

The price obtainable will vary from 3*d.* to 1*s.* per pound. The crop takes about fifteen weeks to mature.

Of a very great many varieties we have grown, "A 1" and "Best of All" have given us the best results.

Should there be an over-abundance of either runner or dwarf beans and no sale, it is desirable to pickle them for winter use as this is very easily and simply done. Take an earthenware jar, clean it thoroughly and then dry it. Place in it a layer of salt, then on this a layer of the picked beans, which should be gathered when dry or dried with a cloth before pickling, and should be neither too old nor too young, then another layer of salt and so on till the jar is full. Fasten the jar down so that the cover is air-tight, and keep it in a cool dry place.

Beet-root (*Beta vulgaris*). Natural Order *Chenopodiaceae* (S. Europe).

This important root requires a deeply worked soil, and the oftener the ground is moved during the winter the better. No farmyard manure should be mixed with the surface soil or the roots will probably be forked. This crop should follow a crop like peas, celery, onions, or cauliflower, for which the ground was well manured.

Before sowing the seed rake over the bed and get a fine even tilth, clearing away all rough stones.

Sow the seed in drills, or channels, 1 inch deep and 12 inches apart. The sowing should be done from April to the end of June. Hoe frequently and thin out the plants to 6 inches apart. For early and late sowings, for immediate consumption, sow the "Globe" or "Egyptian" turnip-rooted varieties which will mature in about twelve weeks.

For winter use sow tap-rooted varieties about the middle of May if quality is wanted.

After trials of over twenty varieties we can recommend "Pine Apple" and "Blood Red".

One ounce of seed will be ample for a row 100 feet long, and the produce should weigh from 2 to 3 cwt.

When "lifting", that is, digging up the roots, be careful not to bruise the skin nor to break off the roots. Do not cut, but twist off the leaves. Lift the roots before the frost comes and store in dry sand or "pit" them, i. e. place them in a heap in the garden, cover them with straw and then with a layer of earth 4 to 6 inches thick, placing a wisp of straw through the top of the soil for ventilation purposes.

Broccoli (*Brassica oleracea botrytis*). Natural Order *Cruciferae* (Italy).

The varieties of broccoli are so numerous that one can have (weather permitting) broccoli for ten months in the year. Our experience is that for school gardens autumn and spring varieties alone should be grown.

Quarter of an ounce of seed will provide plants for a 400 feet row at 2 feet apart. For autumn crops sow under glass in February, or in the open in March, for spring crops sow in the open at the end of April or the beginning of May. Sow the seed thinly in a fine tilth in drills 12 inches apart, covering the seed very lightly (not more than ½ inch deep) with fine soil. Transplant from the seed-bed or frame into a nursery-bed before the plants get drawn and "leggy", and finally transplant into their permanent quarters which for autumn crops should be a well-manured soil; but for spring crops the soil must not be too rich, since a luxuriant and succulent growth before the winter would render the plants too delicate to stand severe cold winds or keen frosts.

Plant in drills 2 inches deep and 2 feet apart each way, and when the plants have got a good start earth them up and give them plenty of water to promote growth and to give a certain amount of protection against strong winds. Shade the plants from the sun's scorching rays.

The varieties we can generally recommend are "Michaelmas White", "Autumn Protecting", "Satisfaction", and "Late Queen".

Borecole, or Kale (*Brassica oleracea fimbriata*). Natural Order *Cruciferae* (Britain).

This very useful winter vegetable requires well-cultivated ground, but not over-manuring. It is often planted between rows of potatoes at 2 feet apart from plant to plant. A quarter of an ounce of seed will provide hundreds of plants. Sow the bed in April and May very thinly and transplant, before the plants get "drawn" and spindly, soon after the potatoes are earthed up.

Both the plain and curled-leaved sorts are suitable for school gardens. Variegated kales should be grown in poor and calcareous soils. The varieties we recommend are "A 1" and "Extra Curled Scotch".

Brussels Sprouts (*Brassica oleracea bullata gemmifera*). Natural Order *Cruciferae* (Belgium).

To get very early crops make a sowing of the seed in August, pricking out the plants to 6 inches apart and transplanting in the spring into rows 2 feet apart and the plants also 2 feet from one another in the row. In some seasons these plants are apt to run to seed. Where facilities, such as greenhouses or hotbeds, are obtainable make a sowing in February, prick out the plants early into boxes and transplant into their permanent quarters in April.

As these sprouts are an important crop the ground intended to receive them should be ready for them as soon as the plants in the seed-bed or boxes are ready to be transplanted.

Successional sowings can be made in the open in

March and April. Prick out the plants, when large enough to handle, in rows 12 inches apart, and the plants 6 inches apart in the row. Then, not later than June, plant out in ground in good condition and well manured for the previous crop. This final planting should be in rows 3 feet apart and the plants should be from 2 to 3 feet apart in the row. Where ground is limited plant between every two rows of potatoes after they are earthed up. The plants require a long period, approximately twenty-four to thirty weeks before maturity.

Sprouts should be gathered systematically from the base upwards, leaving the head until the sprouts are all gathered.

Varieties, which may be classified as dwarf or tall-growing, suitable for school gardens: "Dwarf Gem" on good fertile loams but not for shallow soils or exposed localities. The tall-growing varieties are "Exhibition" and "Matchless", these seem to do well anywhere.

Our experiments have proved that there is an advantage in pricking out the plants at least once before the final planting.

Cabbage (*Brassica oleracea*). Natural Order *Cruciferae* (Britain).

To get early "spring cabbage", i. e. in April, May, and June, sow the seed between the 7th and 14th of August; prick out, when large enough to handle, 4 inches apart each way, and plant out in October, or later during open weather, on firm ground which had been well manured for a previous crop. The rows should be 18 inches apart and the plants 15 inches from each other in the row.

In spring hoe the ground freely, but not very deeply, and give the plants in showery weather a light dressing of nitrate of soda, a small teaspoonful to each plant, but in applying it be careful not to let the manure touch the foliage, then mulch with half-rotten stable manure.

"April" and "Flower of Spring" are good early varieties. Cabbage is not in great demand through the summer, it is wanted in the autumn and early winter. Most varieties that are sown in spring will be ready for use in from fourteen to sixteen weeks from the date of sowing. Sow thinly, prick out early, and plant in rows 2 feet apart and the plants 18 inches apart in the row.

"All Heart" and "Improved Nonpareil" are good varieties for general or autumn and early winter use.

Red Cabbage should either be sown in August, or "in heat" in early spring. The plants when planted out finally should be in rows 2 feet apart and 2 feet from plant to plant in the row.

Savoy or **Dutch Cabbage** (*Brassica oleracea bullata*). Natural Order *Cruciferae* (Europe).

This cabbage is usually sown much too early. April and May are the proper months for sowing. Some varieties may be obtained fit for use at the end of September, but there is no particular advantage in having savoys so early in the season, as their chief recommendation is their great hardiness which renders them available for use during the winter months when other vegetables are difficult to obtain. The varieties we have found most advantageous to grow are "Sugar Loaf" and "Best of All". The former is unique in its habit of growth and can be planted in rows 18 inches apart, and the plants need not be more than 12 inches apart in the row. Savoys can be planted out after early potatoes and in ground well manured for the previous crop.

Carrots (*Daucus carota*). Natural Order *Umbelliferae* (Britain).

The soil for carrots should be well trenched or dug during the winter and if any stable manure is applied it should be placed at the bottom of the trench. An ideal soil is a sandy loam of great depth. The roots cannot be grown successfully in lumpy soil. Lumps must be broken up and a fine tilth obtained before the seeds are sown. Should it be impossible to obtain this condition it is advisable to make holes with an iron bar in rows a foot apart and with the holes 8 inches from one another in the rows. These holes should be from 12 to 18 inches deep. A fortnight or so before sowing the seed the holes should be filled in with a compost made of ordinary garden soil, leaf mould, sand, and wood ashes, sifted through a half-inch mesh sieve. Sow only three or four seeds in each hole and on thinning out leave only one plant in each hole. Sowings of carrots can be made out of doors from the end of March till the end of June. For a *late* crop sow an *early* variety late in June. A great mistake is often made by sowing carrots for winter use too early. (The same may be said concerning beet and parsnips). The crop matures in sixteen to twenty weeks. May is a good time for the main sowing.

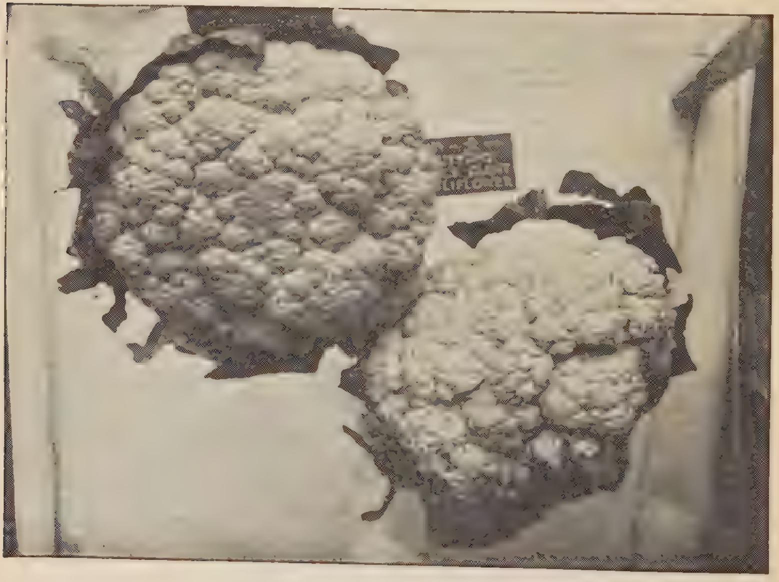
Sow in rows 12 inches apart at a depth of about half an inch. Half an ounce of seed will sow a row 100 feet long and the yield should be approximately 1½ bushels. Mix the seed with fine dry soil, or sand, to sow thinly. When the plants are growing thin out to 3 inches and then to 6 inches apart in the row. We have found "Early Gem", "Favourite", and "New Red Intermediate", satisfactory varieties to grow.

The roots should be "lifted" before the frost comes, and then the roots should either be "pitted" or stored in dry earth or sand.

During summer the hoe should be kept going steadily. A light dressing of nitrate of soda, ½ oz. to each yard run, during showery weather, is helpful.

Cauliflower (*Brassica oleracea botrytis cauliflora*). Natural Order *Cruciferae.*

The cauliflower requires a well-cultivated and rich soil. Unless there is convenience for sowing indoors for the early crops it would be advisable to buy the plants required. If " heat " can be had sow early in February. Prick out into boxes as soon as the plants are large enough to handle, and plant in the open about the beginning of April in rows 18 inches apart and 15 inches from plant to plant. At the end of March or early in April sowings can be made outside, sow thinly and prick out early, 6 inches apart from plant to plant, in richly-prepared ground; finally plant out when large enough in rows 2 feet apart and 18 inches from plant to plant. The time the crop takes to mature is from sixteen to twenty-four weeks.



"Early Giant" Cauliflower.

The varieties we can recommend are " Purity ", " Early Giant ", and " Autumn Mammoth ".

To keep the heads a good colour tie up the leaves or break them down over the " flower ".

Celery (*Apium graveolens*). Natural Order *Umbelliferae* (Britain).

Celery should be grown in a rich soil retentive of moisture, but with no stagnant water. For early crops sow in March under glass, but for the main crop sow outside on a warm border where the young plants can be protected from cold winds during April. When the seedlings are large enough to handle, prick out from the early sowing to 6 inches apart into a frame in which good rotten dung, leaf mould, and loam have been well mixed together and laid to a depth of several inches; water and shade them for a few days, encourage "stocky" growth in the plants by giving them air on all favourable occasions. High temperature and sudden changes tend to produce "bolting" of the plants. During the growth of the plants the trenches into which they have to go must be prepared. Many systems are recommended. We find that if trenches are marked out 3 feet apart, about 15 inches wide and 12 inches deep, and 6 inches of this is filled in with a mixture, thoroughly made, of rotten manure, leaf mould, and surface soil, the results are as satisfactory as with more elaborate methods. When transplanting into the trenches one must first see that the soil in the trenches, as well as that in which the plants are growing, is nice and moist. If there seems a tendency to dryness give a thorough soaking the day before planting out. Lift the plants carefully with a trowel and plant about 8 inches apart in the trench. After planting out give the plants a good watering and shade for a few days. During the summer the plants should be well watered and liquid manure, both farmyard and chemical, should be supplied. Do not begin to "earth up" the plants until the growth is practically completed. The edible part of the celery is the blanched leaf-stalk. The "blanching" or "earthing up" is done either by putting and pressing finely powdered soil round the plants, taking care that none of it gets into the heart of the plant, or by putting strong paper round each plant. It takes from six to eight weeks to properly blanch the leaf-stalks.

The varieties grown satisfactorily are "A 1" (red), "Solid White", and "Sulham Prize" (red).

Cucumber (*Cucumis sativus*). Natural Order *Cucurbitaceae* (E. Indies).

The open air cultivator must either dig out a trench 2 feet wide and 1 foot deep, or must make holes 2 feet across and 1 foot deep, the holes being 4 feet apart. The trench or the holes must be filled with some "heating manure" which must be lightly trodden down and covered with about 4 inches of soil. This should be done early in May. Towards the end of the month the seed should be sown 12 inches apart in the trenches, eventually thinning to 3 feet apart. Where holes are made three seeds should be planted in each hole, eventually thinning out to one plant in each hole.

Protect the plants from cold winds and frosty nights whilst young.

After they are established and growing freely pinch or stop the plants. Water and feed with liquid manure through the summer.

"King of the Ridge" and "Stockwood" are good serviceable varieties.

Leek (*Allium porrum*). Natural Order *Liliaceae* (Switzerland).

The leek should have a long season of growth, from twenty-four to thirty weeks.

There are many methods of cultivation adopted, but the simplest and probably the best is to sow the seed in March and April rather thickly; allow the plants to grow till 8 inches high, then plant out with a dibber into rows 12 to 18 inches apart and the plants 8 inches apart in the row, making holes 6 inches deep and dropping a plant into each hole up to the base of the leaves.

During the summer keep the hoe going freely ; water and feed with natural and artificial manures as necessary. As the plants grow earth up to the base of the leaves. To get large exhibition leeks sow the seed much earlier, prick out and afterwards plant into trenches enriched with plenty of farmyard manure ; feed freely and earth up as required.

Some excellent leeks can be had the following April and May by dibbling in plants on an onion bed as soon as the onions are lifted in the autumn.

Little growth will be made till spring, the plants will then grow freely, and if attended to by hoeing, earthing up and feeding they will do well.

Good varieties to grow are " Prizetaker ", " Favourite ", " Musselburgh ", and " The Lyon ".

Lettuce (*Lactuca sativa*). Natural Order *Compositae* (S. Europe).

To get early spring lettuces sow the seed in August and September. Plant out when large enough into rows 12 inches apart and the plants 6 inches apart in the row.

To stand the winter they should have as much protection as possible from damp and frost, therefore planting under trees and fences is advisable.

Sowing outside can commence in March and be continued at intervals till the autumn sowing in August or September. For early work sow the cabbage type which turns in quickly. " Commodore Nutt," " Malta," " Continuity," and " Tom Thumb ", are good.

To obtain large exhibition cos lettuces plant in richly manured ground and feed. Plant in rows 12 inches apart and the plants 9 inches apart in the row.

Now there are so many self-folding varieties the tying up of the leaves when the plants are three parts grown is not much done.

Good varieties are "Superb White Cos", "Mammoth White", and "Peerless".

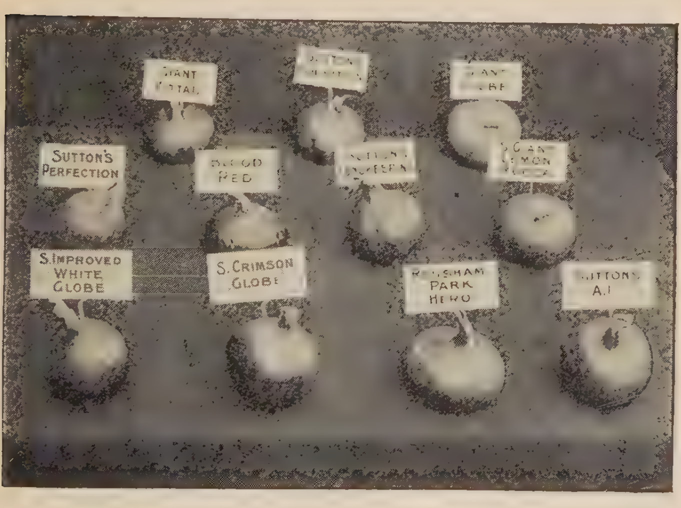
Tying up Lettuces.

Onion (*Allium cepa*). Natural Order *Liliaceae* (Asia).

The successful cultivation of the onion requires a deep rich soil and a long period of growth.

The ground should be trenched 2 to 3 feet deep in the winter, in the bottom trench add garden refuse, roadside quarterings, &c.; to the top spit add plenty of good stable manure, and if the soil is retentive add 7 lb. basic slag, 5 lb. wood ashes, and when raking down the bed for seed sowing add 5 ℔. of soot to each pole of ground. Burnt soil and lime are good for heavy soils. To a light soil give a mixture of 4 ℔. superphosphate and 4 ℔. kainit, adding, when raking down the bed for seed sowing, 3 ℔. of salt and 5 ℔. of soot—these quantities to each pole of ground.

During March on a nice dry day and when the soil is workable, break down the lumps of earth, rake off the stones, level the ground and tread to get a firm surface.



Some Useful Varieties of Onions.

Draw drills at 1 foot apart and about ½ an inch deep.

Sow the seed thinly, making an ounce do a 200 feet row. When the plants are up in the row hoe to loosen the surface soil, but do not hoe deeply.

Thin as required for use, finally leaving the plants 6 inches apart in the row.

Feed with guano, nitrate of soda, and soot. For quantities see table.

In a hot dry summer mulch with short manure.

When the tops show signs of ripening bend them over, this will have the effect of swelling and ripening the bulbs. Before storing have the bulbs well ripened by laying them out on a gravel path, hurdles or corrugated iron.

The varieties for sowing outside are " A 1 ", " Improved Reading ", " Nuneham Park ", " White Spanish ", and " White Globe ".

The varieties to grow for exhibition, and to be sown under glass in January and February, and planted out in April in rows 18 inches apart and plants 12 inches apart in the row, are " Ailsa Craig ", " Cranston's Excelsior ", and " Southampton Champion ". Lift and plant with a trowel.

Autumn-sown onions are larger and earlier than spring-sown and are considered almost proof against the fly.

The approximate time for sowing is the first week in August.

Sow thinly in rows 1 foot apart, do not thin out or transplant till the following March ; then thin to 3 inches apart, afterwards to 6 inches apart, using the thinnings for home use.

In regard to transplanting of autumn-sown onions the results of a number of experiments showed the yield in weight to be as four to five in favour of non-transplanting. But the percentage going to seed was considerably less in the transplanted than the non-transplanted, being as two to three.

A good crop would be from 4 to 6 bushels from a pole of ground.

The following out of thirty varieties sown in the autumn gave good results :—" James's Long-Keeping," "Deptford," "White Spanish," "Cranston's Excelsior," "Giant Rocca," "Giant Zittau," and "A 1".

Almost any variety of onion can be grown for pickling if the seed is sown thickly close up to a row of peas and not thinned.

Parsnip (*Pastinaca sativa*). Natural Order *Umbelliferae* (Britain).

The ground for parsnips should be well trenched or deeply dug in the winter; and if any stable manure is added put it at least 12 inches deep in the trench.

Before sowing the seed, which can be done from February till end of April, rake down the soil and get an even surface, draw the drills 15 inches apart and about 1 inch deep. Sow the seed very thinly, making an ounce do a 200 feet row. Thin the plants early, first to 4 inches apart and then to 8 inches apart; keep the hoe going freely through the summer. A few roots can be lifted as required for use, but the bulk of the crop should remain in the ground as long as possible. When lifted store in sand or dry earth or else "pit" them. In very heavy soil the land can be "barred" for the crop, i.e. holes can be made in the ground as for carrots, or some of the roots can be grown in small drain-pipes.

"Tender and True" and "Hollow Crown", are good varieties to grow; the former does particularly well on a shallow stony soil and the latter on a well-cultivated loam.

Pea (*Pisum sativum*). Natural Order *Leguminosae* (S. Europe).

For very early crops sow round peas, not wrinkled, on a south border in October and November, varieties hardy and of a dwarf habit of growth so as protection can be given if necessary during inclement weather. Usually February is soon enough to make the first sowing of peas outdoors.

Choose a nice warm border and sow a dwarf-growing variety like "William Hurst" in drills 2 feet apart. Successional sowings can be made in the open till the end of June; sowing an early variety for the late crop. The ground for peas should be well dug or trenched in the winter, mixing with the soil lime rubble, and bone meal, or in place of these a quantity of basic slag 4 oz. to the square yard.

At sowing time level down the ground and dig a trench one spit deep; mix with the soil at the bottom of the trench if sweet and good (if not, throw it out and replace with surface soil), plenty of rotten manure, then add 3 inches of surface soil; sow the peas on this and cover 2 or 3 inches deep.

Instead of sowing the peas together, row after row, we find it an advantage to have a dwarf-growing crop like beet or carrots between each row, this would make the rows of peas say 6 to 12 feet apart.

Before staking peas they should be earthed up. Then place some bushy birch twigs at the bottom to protect and support the young plants, afterwards the ordinary sticks. Staking peas should be done carefully; first, the sticks should be in line; secondly, they should be placed in a sloping direction in opposite ways on each side of the line; thirdly, the tops should be shortened to give a finish to the work.

For general crops sow the seed much more thinly than for early crops. One pint will sow 100 feet.

The approximate time of maturity of the crops sown in spring and summer will be from twelve to sixteen weeks.

The following have proved good varieties to grow:—"The Sherwood" (1 foot), "Early Giant" (3 feet), "Gradus" (3 feet), "Thomas Laxton" (3 feet), "Duke of Albany" (5 feet), "Autocrat" (4 feet), "Ne Plus Ultra" (6 feet), "Selected Gladstone" (4 feet).

The approximate heights of growth are given, but their height will depend to a great extent on the soil, situation, and season.

Potatoes (*Solanum tuberosum*). Natural Order *Solanaceae* (Peru).

The successful cultivation of the potato depends on very many things, first the soil must be deeply dug or trenched during the winter and left rough for the atmospheric agencies to pulverize and aerate it.

During this time the tubers are being prepared for planting. Imported seed, Scotch or Irish, is advisable; when procured place in boxes or trays crown end upwards, in a light, airy, frost-proof room, and keep near the light till the time for planting.

The tubers should be from 2 to 4 oz. each in weight.

Where every protection can be afforded a few early potatoes can be planted in March on a south border—2 feet from row to row and 12 inches from plant to plant, and 4 or 5 inches deep.

But the general planting should be done in April in rows from 2 to 3 feet apart and the "sets" from 15 to 18 inches apart in the row, and 5 or 6 inches deep.

In preparing the ground for planting put down a line and dig out a trench one spit deep; if the soil is heavy mix with the bottom spit strawy manure and spent hops, if the soil is light mix with it plenty of good rotten manure and plant the sets carefully, which, if treated properly, will have one but not more than two shoots on each set, then fill in with the surface soil, breaking it up finely to cover the sets with, leaving the lumpy parts for the top.

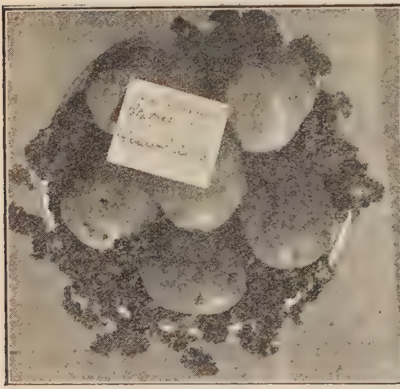
There is much diversity of opinion as to whether cut or whole sets are best for planting.

Probably there is little, if any, difference so far as the total yield of crop; but the advantages in favour of cut sets are that you know whether the tubers are healthy or not, and probably there is a quicker decay of the tubers.

All cut tubers should be smeared in powdered lime before being planted.

Keep the weeds down by frequent hoeing.

Earth up the plants when the growth is 6 or 8 inches high.



A White Round Potato.

A White Kidney Potato.

Lift as they ripen and are required for use; and before winter the whole of the crop should be lifted and "pitted", or put into sacks and kept in a cool, dry, dark place if for home use.

One to two gallons of seed should plant a pole (30¼ square yards) of ground, and the approximate yield should be from 2 to 4 bushels.

The time to mature, according to the variety, will be from twelve to twenty-four weeks.

Radish (*Raphanus sativus*). Natural Order *Cruciferae* (China).

Radishes delight in a rich, moist, warm soil. They

VARIETIES OF POTATOES FOR VARIOUS KINDS OF SOILS

Season	*Chalky*	*Clayey*	*Ironstone*	*Loam*	*Sandy*	*Stonebrash*
Early	2. Eclipse 1. Epicure 3. Sharpe's Victor	2. Eclipse 1. Harbinger 2. Sir John Llewelyn 1. Epicure	2. Eclipse 4. Ninety-fold	2* Snowdrop 2* Dargill Early 1. A 1 4. Ninety-fold 8* Arran Rose	2* Snowdrop 2* Dargill Early 1. Epicure 4. Ninety-fold 8* Arran Rose	2. Sir John Llewelyn 4. Sharpe's Express
2nd Early	2. British Queen 2. Edinburgh Castle	2. Ideal 1. Windsor Castle 6* Ally 1. Acquisition 2. Edinburgh Castle	2. Edinburgh Castle 2. Supreme	6* Arran Comrade 1. Acquisition 1. Centenary 1. Windsor Castle 6* Ally 7* King George	6* Arran Comrade 1. Aquisition 1. Balmoral Castle 1. Sutton Seedling 7* King George	1. Windsor Castle 2. Royal Kidney 1. Warwick Castle 1. Stirling Castle
Main crop	1. Evergood 1* Flourball	2. Abundance 2* White City	1. Evergood 1. Flourball 2. Main crop	2* Abundance 1* Great Scot 5. King Edw. VII 7. Satisfaction	2. Warrior 2. Cottar 5. King Edw. VII	2. Abundance 1. Arran Chief 1. Great Scot
Late	2. Reliance 1. Duchess of Cornwall	2. Reliance 1. Duchess of Cornwall 6* Tinwald Perfection	1 Factor 6. Up-to-date	2* Nithsdale 2. Reliance 7. Superlative 6. Up-to-date 2* Majestic	1. Scottish Champion 1. The Factor 6. Up-to-date 9* Kerr's Pink	2* Nithsdale 2. Reliance 6. Up-to-date 2* Majestic

Description: 1. White round. 2. White kidney. 3. Round, yellow flesh. 4. Kidney, yellow flesh. 5. Coloured kidney. 6. White oval. 7. White oblong. 8. Pink oval. 9. Coloured round. * Considered proof against "Wart" disease.

should be grown quickly and eaten when young. For early crops out of doors sow in February and March on a south border on beds 4 feet wide ; rake the soil down fine, sow the seed broadcast and cover with about an inch of finely sifted soil, or rake the seed in and cover with straw which can be raked off after germination and used at nights only in severe weather.

Make successional sowings at intervals of ten days to a fortnight.

Early thinning of the plants is very important, for those crowded make plenty of top but no root.

An ounce of seed will sow 60 square feet.

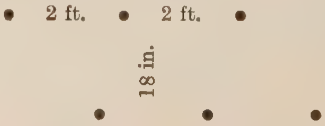
The plants will mature in from six to eight weeks.

From trials of a great many varieties we can recommend :—“ Red and White Turnip-rooted ”, “ Scarlet Olive ”, and “ French Breakfast ”.

Tomato (*Lycopersicum esculentum*). Natural Order *Solanaceae* (S. America).

To grow tomatoes successfully out of doors the seeds *must* be sown under glass and healthy strong plants procured for planting out.

Sow the seeds on a hotbed or in a heated greenhouse any time during the first fortnight in March. Prick out the seedlings when large enough to handle and grow the plants steadily, giving plenty of air on all favourable occasions, till about the first week in June, when they can be safely planted outside, either against a south wall or in the open, if the latter, plant in double rows 2 feet apart, the lines forming the double rows being 18 inches apart and the plants 2 feet apart in the lines and planted alternately—thus



The soil must not be over rich for tomatoes or leaf and branch will take the place of fruit. Plant firmly and tie each plant to a stake about 4 feet in height.

Boys Hoeing.

During growth pinch out all side shoots, and when the plants have reached the top of the stakes pinch out the leader or growing point.

After the fruit is set and the plants are rooted, mulch with horse-droppings and feed with farmyard liquid manure or a little chemical manure.

The approximate time from the sowing of the seed to the ripening of the fruit is twenty weeks. From extensive trials during the last thirty years, the following varieties have succeeded well out of doors, viz. "Maincrop," "Earliest of All," "Open Air," "Eclipse," and "A 1".

A Tomato Experiment.

The seed was sown in a greenhouse on the 19th of March. When the seedlings were large enough to handle they were pricked off into 3-inch pots, one plant in each pot. When these pots were full of roots, the plants were repotted into pots 5 inches in diameter, and grown on in the greenhouse till the 11th of June, when they were planted into the open ground in rows 2 feet apart and 18 inches apart in the rows.

The soil was pressed firmly round each plant. The plants were securely staked against winds. The side shoots were pinched out as they appeared and the leaders were stopped on the 1st of August. The plants were mulched with horse-droppings and supplied with water as required. The first ripe fruits were gathered on the 11th of August and the last ripe fruits on the 9th of November.

The average yield of crop per plant was :

Maincrop variety .	5½ lb.
Earliest of All .	5 lb.
A 1 . . .	4½ lb.
Eclipse . .	4½ lb.

Turnip (*Brassica rapa*). Natural Order *Cruciferae* (Europe).

Turnips should be sown in a rich moist soil. Get a fine tilth, then draw drills 1 foot apart and 1 inch deep ; sow the seed very thinly. One ounce of seed will sow a 100 feet row. Thin the plants to 8 inches apart.

Periodical sowings may be made from March till August.

The turnips will be ready for use in about eight weeks from the time of sowing.

"Early Snowball," "Green Top White," and "Orange Jelly", are good varieties to grow for successional sowings.

Vegetable Marrow (*Cucurbita ovifera*). Natural Order *Cucurbitaceae* (Astrachan).

The vegetable marrow is very easy of cultivation and does not require the elaborate preparations some make in heaping up above the ground-level several loads of manure. Place in some corner of the garden all the refuse possible, on to which put 6 inches of ordinary garden soil.

The first week in May plant in this preparation seeds 12 inches apart and 2 inches deep.

When the young plants come up thin out to 3 feet apart and protect from frost. When the plants are well established and the leaders 2 to 3 feet long pinch out the growing points. Stop the lateral shoots one leaf beyond the fruit. Keep the plants well supplied with water and feed liberally with farmyard liquid manure. Cut the fruits when young and tender, which will prolong the fruiting period.

Good varieties to grow are "White Bush", "Pen-y-byd", "Long Green", and "Long Cream".

LATE CROPPING OF THE VEGETABLE GARDEN

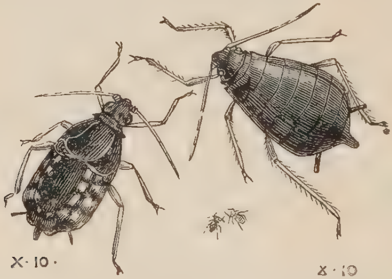
Vegetable	*Variety*	*When to sow*	*Approximate time to mature*
Dwarf Beans	Canadian Wonder	July	10 to 12 weeks.
Peas	Green Gem	July	10 to 12 weeks.
Turnips	Snowball	July & Aug.	8 to 10 weeks.
Beet	The Globe	July	10 to 12 weeks.
Carrots	Early Gem	July	10 to 12 weeks.
Onions	Ailsa Craig	July & Aug.	To stand the winter.
Cabbage	Flower of Spring	July & Aug.	To stand the winter.
Cauliflower	Magnum Bonum	Aug. & Sept.	Requires protection through the winter.
Lettuce, Cabbage	Earliest of All	July	8 to 10 weeks.
,, Cos	Winter White	Aug.	To stand the winter.
Spinach	Round	July & Aug.	6 to 8 weeks.
,,	Prickly	Aug. & Sept.	To stand the winter.

CHAPTER V

VEGETABLE GARDEN PESTS

INSECTS

Aphides. *Aphis rumicis* or *fabae*, better known by the name of " black or collier fly ", attacks the broad beans especially in hot dry seasons. The insects injure the plants by attacking the young growth, or tops of the stems.



Bean Aphis (*Aphis fabae*—Pupa and Female).
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The sap, running from the numerous punctures which they make by inserting their probosces into the soft tissues, accumulates on the stems, giving the plants a dirty-looking appearance.

Autumn or early spring planting of the best seed, combined with good cultivation is to be recommended. If, however, in spite of this treatment the tops are attacked, which is very likely, cut them off and burn.

Frequent syringings with soap-suds and soft-soap and water, adding one wineglassful of paraffin to each gallon of liquid, will do good. When paraffin is added keep it thoroughly mixed by stirring when applying.

Aphis brassicae. These "green flies" are in some seasons found in very large numbers on the leaves, particularly the under side, of cabbages and other plants belonging to the Brassica section. Leaves very badly attacked should be burned.

Dusting the plants with lime or soot and syringing with soap-washes will do good.

Aphis rapae. This Aphis, which is said to attack not only the turnip but also swedes and potatoes, is not usually very common.

Where present on the leaves in large numbers apply soot or lime and the soap-washes previously recommended.

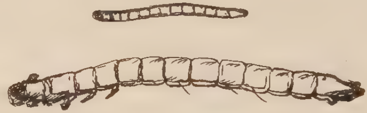
Beetles. The Broad Bean beetle (*Bruchus granarius* or *rufimanus*) is to be found in most seasons. We are told that the eggs are laid in the blossom of the bean before the seed vessel is large enough to be called a pod.

The maggots live on the fleshy material in the seed.

At planting time the fully-matured insect will often be found in the seed; the presence of the beetles is generally recognized by discoloured patches of the skin about the size of a pin's head under which they are to be found.

Dipping the seed in boiling water for one minute is said to be sure death to the beetles, without injury to the seed but it is not so good or safe as hand picking.

Click Beetles (*Elater* or *Agriotes*). In the larval or maggot stage the four species of Click Beetles (known as the wireworm, which is said to live in the larval condition from three to five years) do a great amount of injury to carrots, potatoes, and other crops. A dressing of gas-lime, 14 to 20 ℔. to a pole of ground, spread on in the autumn is an old remedy. A dressing of kainit applied any time through the winter at the rate of 2 to 3 ℔. to the pole has in many cases proved effectual in destroying wireworm.



Wireworm (*Elater*).

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To sow mustard as a catch crop and dig it in in the spring is a good thing.

A dressing of Homco Rape Meal after thinning out is an excellent remedy.

Turnip Flea Beetle (*Haltica* or *Phyllotreta nemorum*). In very hot dry summers it is difficult to get good turnips owing to the presence of this pest.

Early and late sowing, good cultivation, freedom from weeds, especially those which belong to the same family as the turnip, and high feeding, do much to ensure a crop.

Frequent dressings of soot and finely powdered lime will check ravages of the beetle.

Weevils. The Cabbage and Turnip Gall Weevil (*Ceutorhynchus sulcicollis*), is well known by causing the large knobs to form on turnips and swedes in which, if cut open, would be found the thick, fleshy, wrinkled maggots—and on the stems of cabbages and other Brassica below the surface of the soil; preventing in this case true root formation. By many this knob formation is considered a form of, and is called, Club Root, though really it is not so. The weevils make holes in the turnips and in the stems of the cabbages, after which they lay an egg or a number of eggs in each hole.

It is advisable to adopt a system of rotation of crops so as to avoid growing the same kinds of crops on the same piece of ground two years in succession.

Plant nothing but healthy plants free from galls on their stems.

It is a good plan before planting to dip the roots in a mixture of clay and soot.

Pea Weevils (*Sitones*) of which there are several species, are in some seasons very injurious by destroying the foliage of young pea and bean plants. Dressings of soot should be frequently given round and amongst the plants.

Encourage rapid growth of the plants by good cultivation.

Butterflies (*Pieris* in variety) and **Moths** (*Mamestra brassicae*). The caterpillars of these cabbage pests do, in some seasons, irreparable damage.

It is sometimes extremely difficult to keep them in check. Cleanliness is one of the chief factors; do not allow rubbish of any kind to accumulate wherein the caterpillars can hibernate.

Syringing or watering the plants with soap-suds prevents the butterflies and moths from laying eggs on them. As the underside of the leaves is generally chosen for this purpose special attention should be given to wetting this part, which it is admittedly difficult always to do.

Hand-picking of the caterpillars, though tedious, is an excellent method for reducing the ravages caused by them.

Pea Moth (*Grapholitha pisana*). In some seasons peas are infested with maggots, though little account is taken of them.

When such is the case burn the haulm or straw and also the peas. When the peas are ready for use gather the pods at once, do not allow them to get old.

Bury to a good depth the surface soil infested with chrysalids, in this way the moths are prevented from coming out.

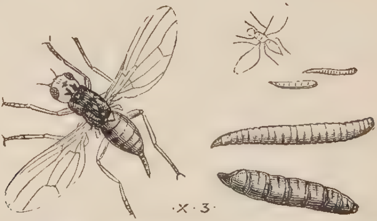
Flies.

Snowy Fly (*Aleyrodes proletella* or *Chelidonii*). This small, frail, four-winged snow-like fly attacks cabbages, tomatoes, and other plants.

In some seasons it is very plentiful, whilst in others it is not seen.

Syringings with soap-washes, tobacco-water, or quassia extract, soon destroy the flies.

Carrot Fly (*Psila rosae*). The presence of this pest is outwardly recognized by the leaves turning yellow and withering.



Carrot Fly, *Psila rosae* (with Maggot and Chrysalis).
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On examination of the young carrots larvae or maggots will be found in and protruding from the roots.

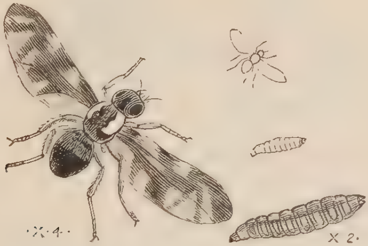
The material thrown out by the burrowing of the maggots into the roots is of a rusty or yellowish colour from which it gets the name of carrot " rust ".

Thorough winter preparation of the ground, thin sowing of the seed, and early thinning are preventive methods in so far that they encourage rapid, strong, healthy growth.

Add gas-lime to the soil in winter at the rate of 14 to 21 ℔. per pole of ground. Allow it to lie on the top after ridging, rough digging or trenching, at least six weeks before mixing it with the soil.

Use wood ashes with the seed at sowing time. Dressings of soot after thinning the plants will prove effective in reducing the damage which would be caused by the fly.

Celery and Parsnip Fly (*Tephritis onopordinis*). This fly punctures the young tender leaves of the plants and lays between the two skins eggs from which larvae or maggots appear.



Celery Fly and Larva (*Tephritis onopordinis*).
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In some seasons the leaves are tunnelled with these so-called " miner " maggots.

The pinching of the maggots with thumb and finger when seen on the leaves will, if followed up, keep them well in check.

Dressings of soot and syringings with soap-suds and other washes make the leaves distasteful to the insect.

The celery plants should not be allowed to become dry at the root.

Frequent syringings of the plants in the evenings of hot, dry days will do good, promoting healthy and rapid growth.

Onion Fly (*Anthomyia ceparum*). The injury it does to the young onions at the base of the stem is well known.

The first indication of its presence is generally shown by the leaves turning yellow and then drooping. To reduce the chances of an attack of this pest to a minimum well trench and heavily manure the soil, get the best seed, sow thinly, thin early, and feed liberally.

Onion Fly (*Anthomyia ceparum*).
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If then you fail, sow along with the seed in the drills fine sand soaked in paraffin ; and when the plants are thinned, firm the soil by treading ; or where the soil is light and the plants are not too forward put over it a light wooden roller. Then syringe or water the plants overhead occasionally with soap-suds or a paraffin emulsion made of 1 wineglassful of paraffin, 1 oz. of soft-soap, and 1 gallon of water ; keep it well mixed when using.

Pull up and burn all plants suffering with the maggot.

If you fail after all these methods have been tried resort to autumn sowing and transplanting in the following April into well-prepared ground. This system of cultivation is practically proof against the maggot of this fly.

Slugs (*Limax agrestis*, greyish in colour, and *Limax hortensis*, a small black slug) ; and **Snails** (*Helix*), of which there are several species, do a great amount of damage to nearly all young growing crops. The crops they frequent should be kept well dressed with soot, salt, or lime.

They can be trapped by laying about cabbage and lettuce leaves, slices of turnip, &c., which should be examined daily and the pests killed.

Eelworms (*Anguillulidae*). Cucumbers and other plants frequently suffer with stem eelworm. The mode of attack is for the eelworms to puncture the roots and then lay their eggs in the punctures.

From these eggs emerge the eelworms which quickly traverse the inside of the stems, causing the plants to wilt and die. These punctures bring up nodules, warts, or swellings on the roots.

A magnifying glass is required to make these pests visible.

There appears to be no remedy. All the attacked plants should be burnt, and also the soil in which the plants were growing.

Woodlice (*Oniscus*) do a lot of harm by gnawing the tender shoots of plants.

Boiling water will effect a clearance of this pest where it can be used without injury to the plants. They can be trapped by slices of potato, or moss, or old hay, put into pots which should then be inverted and stood about in places they frequent. Examine these traps daily and destroy all woodlice caught in them.

Ants (*Formica*) often prove troublesome.

When their nests can be found boiling water will destroy them.

Dressing the crops with soot or syringing with soap-washes will drive ants away.

Centipedes (*Geophilidae*) are considered useful rather than harmful as they feed on injurious insects, and destroy decomposing animal matter.

Millipedes (*Julidae*), on the other hand, live chiefly on vegetable matter, doing injury to tuberous and bulbous plants.

Soot and lime should be freely mixed with the soil where these pests are.

They can be trapped by decaying vegetable matter, such as leaves of cabbage, potato tubers, &c.

Rats and **Mice** must be trapped or poisoned by one or other of the many traps and poisons made and sold for the purpose.

Birds, although doing a little harm occasionally, are really useful in a garden in eating insects.

They can generally be kept off beet, peas, &c., by putting a few lines of black cotton along the rows.

DISEASES

Cabbage. An endophytal disease known by the name of Club-root (*Plasmodiophora brassicae*), producing large swellings of unnatural growth and preventing true root formation, attacks not only the cabbage but other plants, cultivated and wild, which belong to the order Cruciferae. Some soils are entirely free from the disease, whilst others are thoroughly and entirely permeated with it.

Where the latter is the case it is difficult to successfully grow a good crop of any " brassica " plant.

Weeds which belong to this order should be kept down ; diseased plants should be burnt and, if the disease is very bad, the soil in which the roots of the plants have been should also be burnt.

Endeavour to starve out the disease by not growing a brassica plant on the soil for some years.

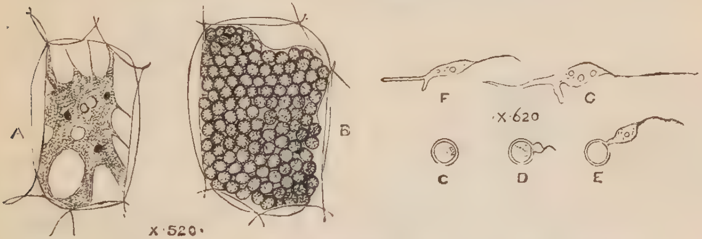
A dressing of burned lime, 28–56℔. to 1 pole of ground, mixed with the soil in the autumn or early winter does good.

Onion. The Onion Mildew (*Peronospora schleideniana*) is known to almost every grower. The disease is first recognized by the yellow patches on the leaves, followed by a white dust-like bloom which, if not checked, results in the wilting and dying of the leaves.

Soils and seasons have their influence on the presence or absence of the disease.

Autumn-sown plants are less liable to be attacked by it, and if attacked suffer in a less degree than spring-sown.

Onions should be grown in an open airy place and in deeply cultivated and well-manured soils.



Fungus of Finger and Toe Disease (*Plasmodiophora brassicae*).
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Use the best seed only, sow thinly, giving plenty of room between the rows, and thin early to at least 3 inches apart and finally to 6 inches apart. Keep down the weeds and promote quick growth by frequent hoeing.

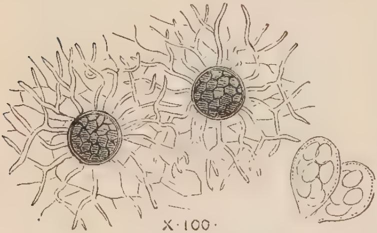
On the first appearance of the disease syringe the plants with either sulphide of potassium (liver of sulphur), ½ oz. to 1 gallon of water with a little soft-soap dissolved in the liquid to make it adhere to the leaves, or with the "Bordeaux mixture" which is made from sulphate of copper 1 ℔. and lime 1 ℔., to 8 gallons of water. Dissolve and mix in a wooden vessel and apply in a very fine spray by means of a syringe or Eclair, wetting every part of the leaf.

Potato. The Potato Disease (*Phytophthora infestans*) is in damp, close, sunless seasons often very prevalent.

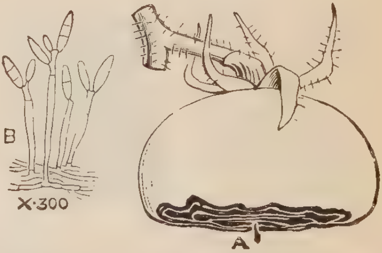
Its appearance is shown by the brown spots on the leaves which in a bad attack soon turn mildewy, then black, the leaves curling up, emitting a strong pungent smell as they decay or die.

Plant strong healthy tubers, as sets of varieties which have been proved to be the least susceptible to the disease. Give plenty of air space between the rows and the tubers in the rows.

The "Bordeaux mixture", if timely applied and the season is not too showery, will keep the disease in check and promote a long period of growth, thereby gaining an increased yield of crop.



Fungus of Pea-Mildew (*Erisiphe Martii*).



"Black-Spot" Disease of Tomatoes (*Cladosporium lycopersici*).

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Two and sometimes three syringings may be necessary to really check the disease.

The approximate cost of each dressing inclusive of labour and materials is 10*s*. per acre.

Do not allow diseased haulm and tubers to rot on the ground, but see they are destroyed by burning.

Pea The Pea Mildew (*Erysiphe Martii*) which works great havoc with late peas, especially in dry summers and on light soils, can to some extent be prevented by sowing the seeds thinly in trenches in which plenty of half-decayed manure has been worked into the soil.

After the pods form, if the season is dry, give the plants a thorough soaking with rain-water, then mulch the ground with manure or lawn grass clippings after mowing.

If the mildew does appear syringe with sulphide of potassium, ½ oz. to 1 gallon of water.

DISEASES COMMON TO VEGETABLES

The following is a list of diseases common to vegetables, details of which will be found in Massee's *Textbook on Plant Diseases.*

Plant	*Part attacked*	*Common name of disease*	*Scientific name of disease*	*Remedy*
Runner Bean	Leaf and pod	Rust	Colletotrichum lindemuthianum	Burn badly attacked parts. Syringe with Bordeaux mixture.
Broad Bean	Stem and leaf	Rust	Uromyces fabae	Syringe with Sulphide of Potassium.
Beet	Leaf	Rust	Uromyces betae	Syringe with Sulphide of Potassium
Cabbage	,,	Mildew	Peronospora parasitica	Syringe with Sulphide of Potassium.
Carrot	Root	Canker	Phoma sanguinolenta	Burn.
Celery	Leaf	Blight	Cercospora apii	Ammoniacal Carbonate of Copper.
Cucumber	,,	Mildew	Peronospora cubensis	Bordeaux mixture.
,,	,,	Blotch	Cercospora melonis	Sulphide of Potassium.
Lettuce	,,	Mildew	Peronospora gangliformis	Air.
Onion	,,	Smut	Urocystis cepulae	Transplant early.
,,	Bulb	Scab	Vermicularia circinans	Burn
Potato	Leaf	Curl	Macrosporium solani	Burn.
,,	Tuber	Scab	Oospora scabies	Change of ground.
,,	,,	Rot	Nectria solani	Thoroughly dry the tubers before storing.
,,	,,	Wart	Synchitrium endobioticum	Grow immune varieties.
Tomato	Fruit	Rot	Macrosporium tomato	Sulphide of Potassium.
,,	Root and stem	Sleeping disease	Fusarium lycopersici	Burn.
,,	Leaf	Rust	Cladosporium fulvum	Bordeaux mixture.

INSECTS COMMON TO FRUITS, FLOWERS, AND VEGETABLES

Plant	*Part attacked*	*Common name of insect*	*Scientific name of insect*	*Remedy*
Apple	Shoots	Woolly Aphis	Schizoneura lanigera	Syringe with paraffin emulsion.
,,	Fruit	Maggot	Carpocapsa pomonella	Syringe trees in summer with Quassia and in winter with Alkali wash
Aster and other flowers	Shoot and leaf	White Slug	Limax hortensis	Trap with lettuce leaves or give frequent dressings of lime and soot.
		Black Slug	Arion hortensis	
Broad Bean	Stem	Black Fly	Aphis rumicis or fabae	Pinch off tops and burn.
Black Currant	Buds	Mite	Phytoptus ribis	Burn.
Cabbage	Leaf	Fly	Aphis brassicae	Syringe with soap-suds.
,,	,,	Caterpillar	Pieris brassicae	Hand-picking
Carrot	Root	Fly	Psila rosae	Rotation cropping. Gas lime the land.
Carrot and other crops	,,	Wireworm	Elater or Agriotes	Dressing land with Gas lime.
Cucumber and other crops	Stem	Eelworm	Anguillulidae	Burn attacked plants
Cucumber and other crops	Leaf	Red Spider	Tetranychus telarius	Moisture.
Cucumber and other crops	,,	Thrips	Thrips minutissima	Moisture.
Dahlia and other flowers	Bloom	Earwig	Forficula auricularis	Trap by putting hay, &c., into pots inverted on stakes.
Gooseberry	Leaf	Caterpillar	Abraxas grossulariata	Syringe with Carbolic Acid mixture.
Onion	Base of plant	Fly	Anthomyia ceparum	Burn infested plants.
Parsnip and Celery	Leaf	Fly	Tephritis onopordinis	Pinch off and burn attacked leaves.
Pea	Seed	Maggot	Grapholitha pisana	Burn.
,,	Foliage	Weevil	Sitones lineatus	Frequent dressings of soot.
Rose	Shoots	Fly	Aphis rosae	Syringe with soap-suds.
Turnip	Root	Weevil	Ceutorhynchus sulcicollis	Rotation cropping.

CHAPTER VI

HERBS

A collection of herbs, "Sweet Herbs" and "Pot Herbs", should be grown in every school garden.

It is not necessary to grow all the undermentioned kinds; but the notes on them may be useful.

Angelica (*Angelica officinalis*, Syn. *A. Archangelica*). Natural Order *Umbelliferae*, is of little value.

The stems and leaves when young are sometimes blanched and eaten. Though a perennial, the plant when grown for use should be cultivated as an annual, the seeds being sown in March and April in drills not more than ½ inch deep.

Balm (*Melissa officinalis*). Natural Order *Labiatae.*

The leaves when dried are used for making an invalid tea. The plant, which is a perennial, can be propagated either from seed which should be sown in May like Angelica, or from cuttings which can be put in any time through the summer in a shady place.

Transplant when well rooted or thin to at least 12 inches apart. For drying, the plants should be cut well back when in full leaf (June) so as to break strong and be kept bushy. There is also a variegated form which is highly ornamental.

Basil, Sweet (*Ocymum basilicum*) Natural Order *Labiatae.*

This is an annual about 1 foot in height. Being of East Indian origin it is often sown under glass in February or March, and planted out into a rich sunny border in May or June in rows 12 inches apart and the plants

8 inches apart. It can be sown out of doors during April and May. The stems should be cut before the flowers open, and tied up into bundles and placed in a cool, dry, airy shed or loft for winter use. This plant, along with Bush Basil (*Ocymum minimum*) which is a dwarf form, is a popular flavouring herb.

Borage (*Borago officinalis*). Natural Order *Boragineae.*

A strong-growing annual which thrives in almost any soil or situation. Sow the seed about ½ inch deep, in April, in rows 18 inches apart and thin the plants to 15 inches apart.

The flowers are used for flavouring purposes. Borage is a favourite plant with bee-keepers.

Chervil, Curled (*Anthriscus cerefolium*). Natural Order *Umbelliferae.*

Seeds of this annual should be sown in a calcareous soil on a warm open border at intervals of a month or six weeks from March till August in drills 8 inches apart, and ½ inch deep, thinning the seedlings to 6 inches apart in the row.

The plant, along with the Fern-leaved Chervil or Sweet Cicely (*Chaerophyllum aromaticum*), is used for flavouring soups, and for salads, &c.

Chives (*Allium Schoenoprasum*). Natural Order *Liliaceae.*

Used as a substitute for the onion in soups and salads. A plant of perennial duration and a native of Britain. It will grow in any ordinary soil and in almost any situation. It is generally grown as a border plant. The plants should be lifted and divided once every four years, just burying the bulbs singly at about 6 inches apart. This can be done either in spring or autumn. To keep up a supply of young growths through the summer the tops or leaves should be cut in succession (a few plants at a time) whether wanted for use or not.

Dill (*Anethum graveolens*). Natural Order *Umbelliferae.*

An annual very little grown. The seeds should be sown ½ inch deep, in April, in rows 2 feet apart and the plants thinned to 12 inches apart. The leaves are used for flavouring soups, &c., and are ready for use any time when wanted.

Fennel (*Foeniculum vulgare*). Natural Order *Umbelliferae.*

A hardy perennial which grows several feet high. The foliage is used for garnishing and for flavouring sauces. Sow the seed in April and May in drills ½ inch deep and 2 feet apart, thinning the plants to 15 inches apart in the row.

Horehound (*Marrubium vulgare*). Natural Order *Labiatae.*

A perennial herb, well known and very useful. Propagated by cuttings or slips, also by seed sown in April in rows 18 inches apart, and the plants thinned to 12 inches apart in the row.

Hyssop (*Hyssopus officinalis*). Natural Order *Labiatae.*

A perennial herb which grows best in a warm situation and on a sandy loam.

The propagation is either by cuttings, which should be handled carefully till struck, or by seed sown in April in rows 12 inches apart and ½ inch deep, the plants afterwards being thinned to 10 inches apart in the rows.

Lavender (*Lavendula vera*). Natural Order *Labiatae.*

A hardy perennial plant, propagated by cuttings or seeds sown in April in a warm sandy soil in rows 18 inches apart and about ½ inch deep, thin the plants to 12 or 15 inches apart in the row.

This plant is much neglected, it is generally seen in a semi-wild condition. To have neat bushy plants, propagate more frequently. The bloom spikes should not be cut till the flowers are well expanded.

Mallow, Curled (*Malva cuspa*). Natural Order *Malvaceae.*

A hardy annual ; the leaves are often used for garnishing. The plant is strong growing and will often reach a height of 5 feet. Sow seed ½ inch deep in rows quite 4 feet apart in April or May.

Marigold, Pot (*Calendula officinalis*). Natural Order *Compositae.*

This well-known annual is grown in the flower garden as well as on the herb border in the kitchen garden. Any ordinary soil suits it. Sow in April, about ¾ inch deep, in rows 12 inches apart, thin the young plants when up in row to 10 inches apart. The flowers are used for flavouring soups and colouring butter.

Marjoram, Pot (*Origanum onites*). Natural Order *Labiatae.*

A hardy perennial plant grown for its aromatic leaves, which can be used green as well as when dried for flavouring. Propagate by cuttings or seed sown in April, about ½ inch deep, in rows 12 inches apart, thin the plants to the same distance apart in the rows.

Marjoram, Sweet or Knotted (*Origanum majorana.*) Natural Order *Labiatae.*

Sow seed in April and treat as Pot Marjoram.

Mint or Spearmint (*Mentha viridis*). Natural Order *Labiatae.*

This well-known British herb can be grown from cuttings or division of the root. It will grow almost anywhere, and can be propagated almost any time. Although a hardy perennial, new plants should be raised every two or three years, if not, the leaves get small and the stems woody. Early supplies of mint can be had by lifting and boxing the roots early in winter and placing in a moist heat of 60° F.

Parsley (*Carum petroselinum*). Natural Order *Umbelliferae.*

A hardy biennial which should be sown bi-annually in March and July. Sow in a rich calcareous soil, ½ inch deep, in rows 12 inches apart, thinning the plants to 6 inches apart in the rows. Young plants can be transplanted successfully if watered and shaded for a time after moving.

One of the best varieties to grow is " Imperial Curled ". In severe winters some protection should be afforded the plants by temporary frames.

Pennyroyal (*Mentha Pulegium*). Natural Order *Labiatae.*

A British perennial, propagated by division and grown like Mint.

Peppermint (*Mentha piperita*). Natural Order *Labiatae.*

A hardy perennial, propagated and cultivated like Mint.

Rampion (*Campanula rapunculus*). Natural Order *Campanulaceae.*

A hardy perennial of which both leaves and roots are used in winter salads.

Sow in May in a rich soil, ½ inch deep, in rows 12 inches apart and thin the plants to 6 inches apart in the row.

Rosemary (*Rosmarinus officinalis*). Natural Order *Labiatae.*

A hardy evergreen perennial, propagated by cuttings or seed sown on a warm border in April, ½ inch deep, in an ordinary soil rich in calcareous matter.

Give the plants plenty of room as they will often attain a diameter of 2 or more feet.

Rue (*Ruta graveolens*). Natural Order *Rutaceae.*

A hardy evergreen perennial, propagated by cuttings in summer and from seed sown in April. A limey soil is necessary. Give the plants plenty of space as they attain a height of 2 or 3 feet.

Sage (*Salvia officinalis*). Natural Order *Labiatae.*

A hardy evergreen perennial, best propagated by cuttings of new growth with a "heel", i.e. a piece of the old wood attached. Insert in June in a calcareous soil on a shady border 12 inches apart each way. Water if the weather is hot and dry and keep the cuttings shaded till rooted.

The plants can also be raised from seed sown in April, in shallow drills 12 inches apart, and the seedlings afterwards either thinned or pricked out to at least 12 inches apart each way.

Savory, Summer (*Satureia hortensis*). Natural Order *Labiatae.*

This sweet-smelling annual is grown from seed sown in April, in rows ½ inch deep, 1 foot apart. Thin the seedlings to 8 inches apart in the rows. Cut when in bloom and tie up in bunches and dry for winter use.

Savory, Winter (*Satureia montana*). Natural Order *Labiatae.*

A hardy evergreen perennial which can either be propagated from seed or by cuttings and treated like Sage.

Usually it is grown from seed and treated like Summer Savory.

Tarragon (*Artemisia dracunculus*). Natural Order *Compositae.*

A hardy perennial, propagated by root division in April.

Thyme, Common (*Thymus vulgaris*). Natural Order *Labiatae.*

This dwarf perennial herb is well known and is in constant demand. It is usually propagated by division, though it can easily be raised by seed and cuttings sown or planted in April.

Thyme, Lemon (*Thymus citriodorus.* Syn. *Serpyllum vulgaris*). Natural Order *Labiatae.*

Propagated by root division only.

Wormwood (*Artemisia vulgaris.* Syn. *Absinthium*). Natural Order *Compositae.*

A hardy perennial, propagated in spring by cuttings or division of the roots.

Place the plants 12 inches apart each way.

CHAPTER VII

SALADS

THE following plants are used more or less for the making of salads, viz. beet, celeriac, celery, chervil, chicory, chives, corn (salad), cress (land and water), cucumber, dandelion, endive, lettuce, mustard, onions, radish, rampion, salsify, shallot, sorrel, and tomato. Cultural hints will only be given here on those subjects not mentioned under either Vegetables or Herbs.

Celeriac or Turnip rooted Celery (*Apium graveolens rapaceum*). Natural Order *Umbelliferae.*

Seed can be sown in March under glass and the seedlings pricked out as in celery. Final transplanting into the open should be done in May.

Plant out on rich loamy soil in rows 18 inches apart each way. Keep the plants well supplied with water in a dry season; and as the roots grow draw the soil away from them. Remove side shoots during growth. For winter use the crop can be stored in sand or in dry, airy cellars.

Chicory (*Cichorium intybus*). Natural Order *Compositae.*

A hardy British perennial grown for purposes of utility as an annual. Sow from April to June in deeply trenched ground free from new farmyard manure, in rows ½ inch deep, 1 foot apart; thin the plants to a foot apart in the rows. If only the blanched leaves are required lift a few roots at a time. Cut away or trim off the first growth just above the crown, then lift and place the roots in deep boxes with fine soil between and put into a dark

Produce grown on School Gardens, exhibited at the County Hall, Oxford.

cellar or shed; keep moist, but not too wet, and the temperature should not exceed 60°. The roots attain full growth in about four months, while usable blanched leaves will be produced in about four weeks after the plants are housed.

Corn Salad or Lamb's Lettuce (*Valerianella olitoria*). Natural Order *Valerianaceae.*

This hardy annual is generally grown to be used when lettuces cannot be had. The seed can be sown any time from February to October in drills, or broadcast in beds not more than 4 feet wide, thinning the plants to 6 inches. apart.

Cress, Garden (*Lepidium sativum*). Natural Order *Cruciferae.*

This is a quick-growing annual, which should be sown at short intervals as required on a finely raked soil. Cut when the growth is young and fresh.

Cress, Land or American (*Barbarea praecox*). Natural Order *Cruciferae.*

Make two or three sowings in the spring and in the autumn on a light, rich soil.

Cress, Water (*Nasturtium officinale*). Natural Order *Cruciferae.*

Is extensively grown in some parts of the country where there are shallow streams.

If grown in the garden plenty of moisture must be given.

Dandelion (*Taraxacum Dens-Leonis*, Syn. *T. officinale*). Natural Order *Compositae.*

A hardy British perennial, grown as a salad plant in some gardens. Sow the seed in May in rows 1 foot apart, thin the plants to the same distance apart in the row. The roots and leaves may be used, the latter should be blanched; which can easily be done by lifting and boxing the roots (first cutting off the old tops) and putting them in a cellar or dark shed, or by inverting pots over the plants in the open ground.

An Exhibition of Produce grown on Oxon School Gardens.

Endive (*Cichorium endivia*). Natural Order *Compositae.*

The plants are grown much in the same way as lettuce, but before using the leaves should be blanched which can be done in many ways. One of the simplest is to tie up the top of the plant when dry and cover over with a flower-pot. The blanching should be done as the plants are wanted, giving from fourteen days in the summer to three or four weeks in the winter for the operation.

Mustard (*Sinapis alba*). Natural Order *Cruciferae*.

Is generally grown with cress, but to come in at the same time it should be sown two or three days later.

Salsify (*Tragopogon porrifolius*). Natural Order *Compositae*.

A hardy biennial requiring a rich sandy loam. Sow the seed in April in rows ½ inch deep, 15 inches apart, and thin the plants to 12 inches apart in the rows. A portion of the roots can be lifted in November and stored in sand or dry soil till required for boiling. Those roots left in the ground will not be injured by frost, and the following spring the young shoots from them can be used when a few inches long in the same way as Asparagus.

Scorzonera (*Scorzonera hispanica*). Natural Order *Compositae*.

A hardy herbaceous perennial which for utility is grown in the garden as an annual or biennial.

A deep-trenched rich soil is required to grow large, clean, fleshy roots.

Sow the seed in April in rows ½ inch deep, 15 inches apart, and thin the seedlings to 12 inches apart in the rows. Keep the ground, as in all crops, free from weeds. The roots and leaves are used in the same way as salsify.

CHAPTER VIII

HOW TO MAKE A HOTBED

The value of a well-made hotbed for the raising of seedlings, rooting of cuttings, &c., cannot be over estimated.

The manure can, after serving this purpose, be dug into the kitchen garden and will be of more good to many crops than new manures.

Hotbeds can be made any time in the year, when manure can be had. But January to March will be the best time for a hotbed in the school garden.

In choosing a site select one with a dry warm bottom and sheltered from the north, north-east and east winds, yet where a maximum amount of sunshine would be got. The area of the hotbed will depend on the size of the frame, bearing in mind that the manure should extend at least 1 foot beyond the frame all round.

Then measure off the length and breadth for the hotbed and drive in at each corner a strong stake, the two at the back to stand 4 feet and the two at the front 3 feet 6 inches out of the ground. Let the bed slope to the south.

The manure, which should be fresh and hot from the stable, must be turned over several times, taking care that it is neither too wet nor too dry when put together.

After thorough preparation spread the manure evenly between the stakes, treading each layer uniformly firm till the heights of the stakes are reached.

With the greater depth of manure at the back more heat would be generated than at the front; to prevent this mix leaves—oak and chestnut are the best—or more strawy manure with the manure used at the back of the frame.

Then put on the frame, but leave the light open for a few days, in such a way that rain cannot enter but steam or gases generated can escape.

When the maximum temperature has been reached (this can be ascertained by inserting a bottom-heat thermometer), the bed should be "soiled" with a mixture of sifted loam and leaf mould to the depth of 4 to 6 inches.

It will be found more convenient to put the seeds and cuttings into boxes and pans and sink them in the soil, than to put them in the hotbed direct, as they can be taken out and replaced with others with less trouble.

To maintain a uniform temperature of 70° to 75° F., it will be necessary during hot sunshine to shade and ventilate; and, on the other hand, when the heat in the bed is being spent a coating of manure should be put round the frame and at night mats put over the lights.

CHAPTER IX

FRUIT CULTURE

THE cultivation of our most important fruits may be dealt with most conveniently in alphabetical order.

Apple (*Pyrus Malus*). Natural Order *Rosaceae.*

The apple can undoubtedly lay claim to first position of all our hardy fruits.

Soil. It requires a strong retentive soil, which has been thoroughly well dug or trenched, but not over-manured. An excellent preparation of the ground for fruit trees in general is to dig or trench and manure and grow a crop of potatoes the summer before planting the trees in the autumn.

Propagation. The apple can be propagated by seed, by cuttings, by "layering", and by "grafting". To raise prolific and healthy trees grafting and budding should be done.

Three kinds of "stocks" are generally used, the "Crab", the "Free", and the "Paradise". The two former are raised from seed and the latter from cuttings carefully prepared. The "stocks" (which are now difficult to buy) should be planted in November in rows 2 feet apart and the plants 1 foot apart in the rows. The following summer they should be encouraged to make free healthy growth by watering and feeding with liquid manure, and syringing as needed; so that in March or April following, i. e. after sixteen or seventeen months' growth, they will be ready for grafting. The "scions" or grafts which are to be used should be taken from the trees in February and should be healthy shoots of the previous year's growth, well matured, and not less than 12 inches in length.

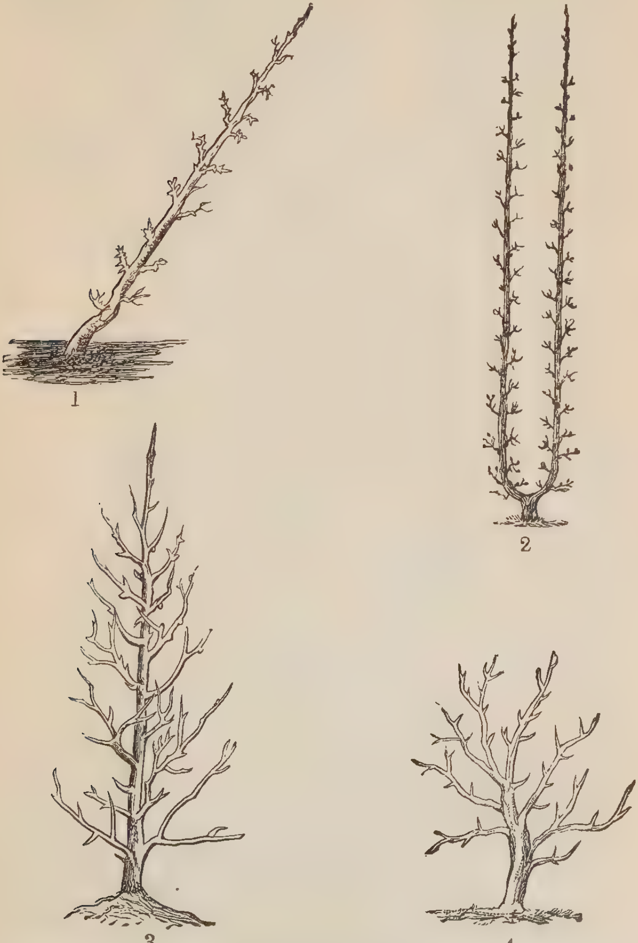
They should be carefully labelled and "laid" or firmly bedded in the soil in the open, about two-thirds their length, pointing towards the north to retard the growth of the buds.

Before beginning the operation of grafting in March or April, depending on the season, have everything, labels, raffia, grafting wax, and a good sharp knife, in readiness. First trim off all the side shoots of the "stock" from the ground, and cut down the stock to a height of 6 inches from the ground.

The method of "grafting" adopted will probably be either the "tongue" or "cleft", according to the strength of the stocks; if the stock is less than 1 inch in diameter the "tongue grafting" is preferable, but if over an inch "the cleft graft". Prepare the "scion" by cutting back the top to the firm wood and dormant buds, slope the cut away from the nearest bud and just above it. Then cut the length to be used, which should not exceed 3 inches. A clean sloping cut about 1½ inches in length is then made at the base of the shoot, which is "tongued", that is, a cut is made in it about ¼ inch from the end on the cut side about ⅛ inch deep, and the blade of the knife is then turned so that the cut, which is about 1 inch long, runs parallel to the sloping cut.

The stock is then prepared to receive the graft by making an upward clean cut on a clear smooth part, corresponding in shape and size to the cut on the graft, preferably opposite to a bud from which the shoot will be rubbed off, because where the bud is there is a reserve supply of ready prepared plant food. The tongue is cut downward so as to fit the tongue in the scion.

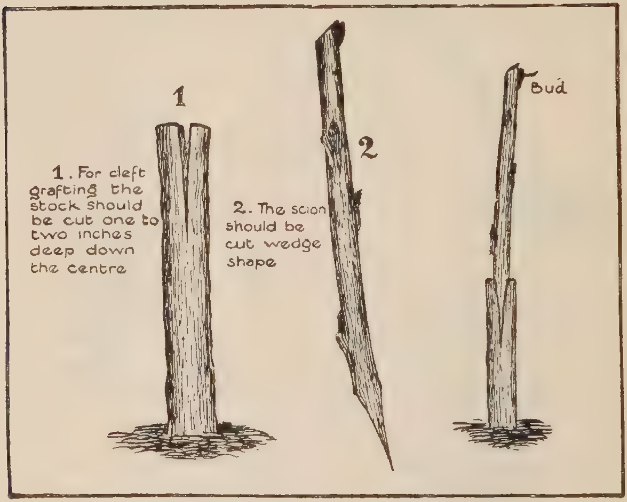
The next operation is to fit the cut parts of graft and stock together so that the barks on *one side* are in actual contact, then with broad strips of moistened or damp raffia bind firmly together. Cover the united parts with grafting wax, which for boys to use is preferable to the



1. Single Cordon. 2. Double Cordon. 3. Pyramid. 4. Bush Tree.
[Copyright J. C. & S.

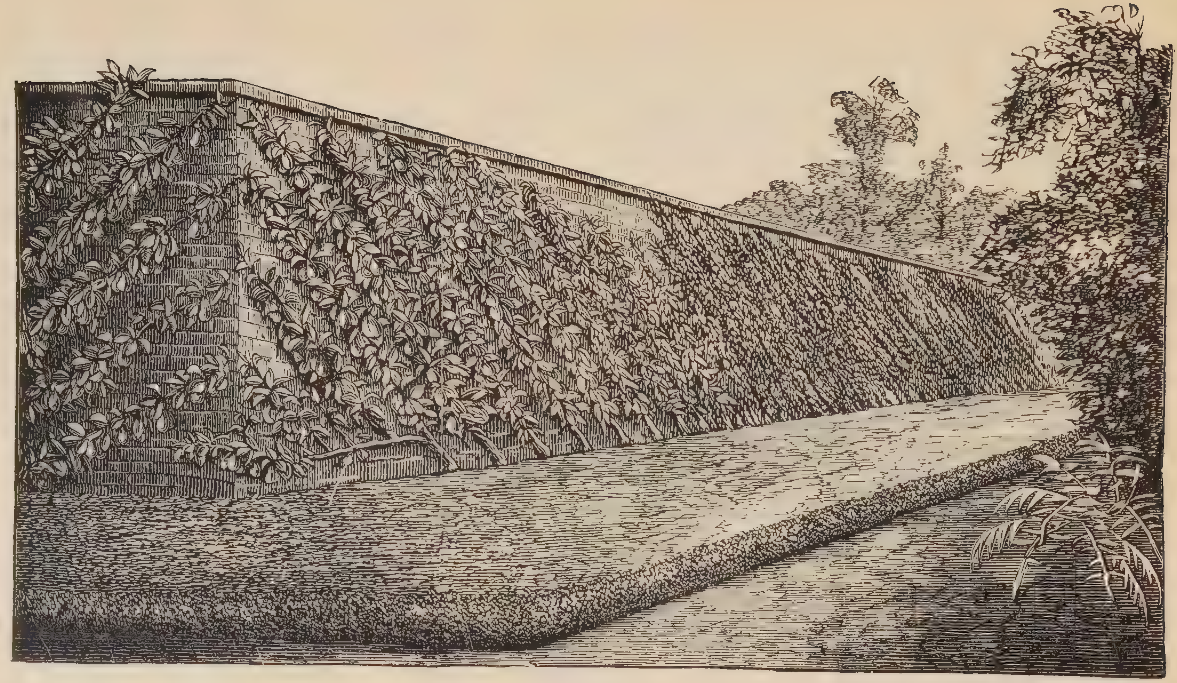
mixture of clay, chopped hay, and cow manure, often used. Keep the young shoots rubbed off the stock through the summer, and, as the growth of the scion extends, undo the binding of raffia as occasion requires and re-tie so as to allow the bark to swell without being injured, or simply run the point of a sharp knife up through wax and bast.

If strong vigorous shoots are made it is necessary to support the graft by a stake, as a protection against strong winds, as it may otherwise be blown off.


1
1. For cleft grafting the stock should be cut one to two inches deep down the centre
2
2. The scion should be cut wedge shape
Bud

Cleft grafting.

For cleft grafting the stock is trimmed and cut down as before to within 6 inches of the ground, and then with a sharp knife a slit is made down the middle about 1 inch in length. The graft is selected as before, but after shortening to the required length, instead of making a tongue cut, the base of the shoot is cut wedge-shaped, the same length as the depth of the cut in the stock.



Cordon-trained Trees on Wall.

[*Copyright J. Cheal & Sons*

Two grafts are usually put into each stock, the outer barks of which must be in contact with the bark of the stock on one side, then bind firmly together and cover with wax.

Do the operation quickly and neatly, and see that the sap in the stock is well up. This is seen by the buds in the stock beginning to unfold.

The "Crab" with its long strong roots is undoubtedly more suitable for large standard trees and also for pyramids and bushes to be grown on shallow stony soils, and for the weak-growing varieties of apples. The Paradise stock with its spreading fibrous roots is better for trees to be grown as bushes and pyramids on rich retentive soils, and for the strong-growing varieties.

As the trees grow training and pruning must be done from time to time and not be left till several years' growths have been made. The following are the chief forms or shapes of trees :—

Standard with a stem 6 or more feet in length and suitable for orchards.

Standard-trained for high walls and buildings.

Single cordon for walls or piers.

Double cordon for edgings for garden walks.

Espalier fan-trained for walls and buildings.

Horizontal-trained for walls and buildings.

Half-standard for gardens.

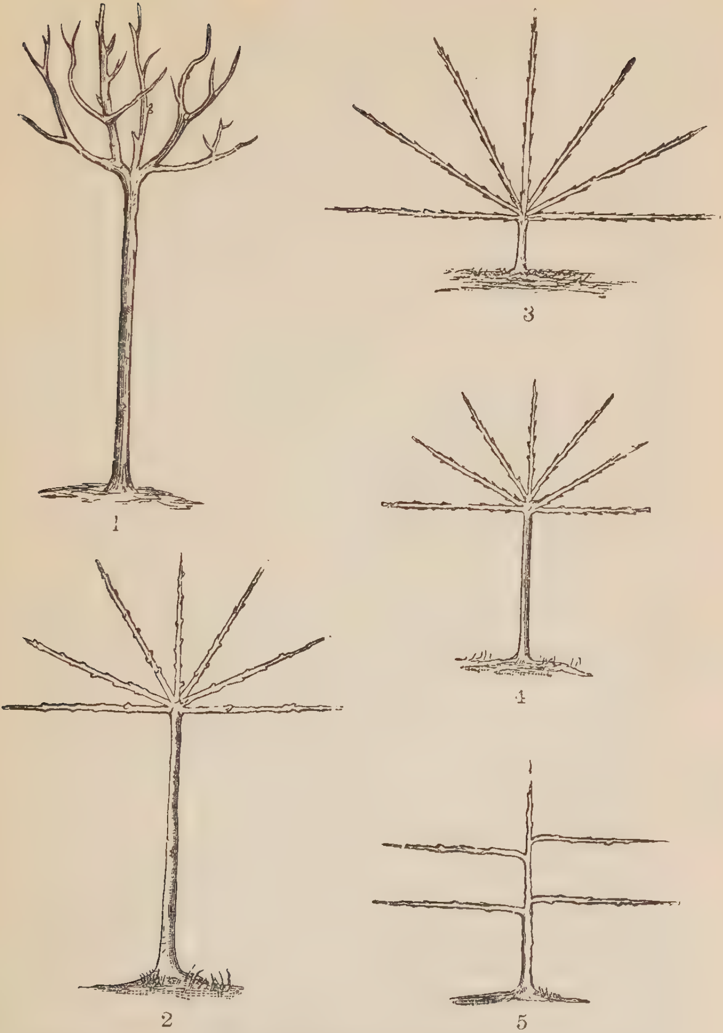
Bush for cottagers' gardens.

Pyramid for ornamental purposes.

The second year after grafting the trees should be transplanted, which operation will check rampant growth and promote fruit buds.

The best time to do this is early in the autumn as soon as the leaves fall from the trees, and when the soil is neither too wet nor too dry.

Having decided the "form" of tree to plant, first measure off the distances where the trees are to be planted



1. Standard. 2. Standard Fan-trained. 3. Espalier or Dwarf Fan-trained. 4. Half-standard Fan-trained. 5. Horizontal.

[*Copyright J. C. & S.*

(see Table in Appendices for distances apart), then dig a hole, not too deep, but sufficiently wide for the roots to be spread out.

If the ground has been prepared as already advised no manure will be necessary, but if manure is necessary mix it well with the soil in the bottom of the hole and then cover with a few inches of surface soil, so that the roots do not come into contact with it. Before planting drive an ash stake, which has been pointed and charred, into the centre of each hole.

Every newly-planted tree should be staked, and it is much better to put in the stake before planting than run the risk of damaging the roots and branches when driving the stake home. A few inches of the charred part of the stake should be above the surface of the soil when planting is completed.

The trees for transplanting should be lifted with care so that undue injury is not done to the roots. The roots should not be exposed to frost or dry cutting winds.

Re-plant as soon as possible, but first see to the shortening back of the long strong roots, making the cuts on the underside, i.e. from the centre to the outside of the tree, so that the cut parts will lie flat on the soil.

Set the tree on a firm bed on a slightly raised mound against the stake placed in the centre of the hole ; then spread out the roots carefully, being careful that none are twisted, curled, or broken.

Fill in between the roots with fine soil, then shake the tree gently to settle the soil and fill up all the spaces, add more soil and repeat the shaking of the tree, then tread the soil firmly over the roots. Each layer of soil added should be well trodden or "firmed". The earth-mark on the stem of a tree is a good guide as to how deep a tree should be planted—never plant deeper than this. After planting, tie the tree securely to the stake.

Hay or straw bands or rubber should be put round the tree, then tie tightly to the stake with tarred string to prevent chafing of the bark and any possible chance of the roots being disturbed during strong winds, for there is nothing more harmful than the roots of young trees being constantly disturbed or broken from their hold of the soil.

Finish off round the tree by making a slight mound and giving a mulching of decayed manure, not more than 3 inches thick, and just covering the area of soil disturbed. Do not put the manure against the stem of the tree, as is so often done.

Pruning. The objects of pruning are to encourage and regulate growth so as to admit light and air to shoots and branches, to encourage fruit-bud formation, to increase size of fruit, to improve colour and flavour of fruit, to shape trees to suit local requirements, and to eradicate pests.

It is impossible to lay down hard and fast rules to be followed in pruning.

If one keeps in mind the idea that in branch pruning each branch should be, as it were, a fruit tree in itself, studded with fruit spurs and buds from the bottom of the branch to the base of the one year old wood.

The pruning of young and newly-planted trees should not be done till March, but old trees can be pruned in winter and the branches not required taken out at any time. The severe shortening back of the young shoots year after year is wrong, and produces mop-headed trees filled with useless "spray", or thin and weakly growth. The so-called summer pruning is done about the end of August, and is the shortening back of the lateral shoots to four or five buds from the base of the shoot; it should be done every summer.

The habit of growth of a tree will determine somewhat the amount of pruning to be done; the upright growers should be well thinned out instead of being cut hard back; the horizontal and pendant growers usually make less growth than those which grow upright, and therefore will require more shortening back to encourage new wood; for the harder a tree is pruned, provided it is healthy, the more growth it will make.

The cuts on the young shoots and leaders should always be made, if for extension of growth, near to outside wood buds and sloping away from the buds at an angle of about 45°. The difference between a fruit and a wood bud should be clearly understood before one starts to prune a tree. In the apple the distinction between fruit and wood buds is most clearly seen. A fruit bud can be recognized by being a rounded bud covered with a white woolly or downy material, sticking out nearly at right angles from the branch or shoot; the wood bud is long and pointed and generally points along the branch or shoot, and is covered with a brown scaly material.

Cut away weak, unripened, green-coloured, and worthless shoots. Branches growing towards the inside of a tree, or which rub against another, should be taken out. Keep the centre of trees well "open" or free from shoots. When large limbs are cut off, take them off near the fork or the adjoining branch, do not leave a "snag" end, that is a small part of the branch, as from this will grow a quantity of small shoots. Saw the branch first from the underside for a short distance, then finish by cutting through from the upper side; this will prevent the splitting or tearing down of the bark on the adjoining branch.

After the branch has been cut off, bevel the cut with a good sharp knife and cover the wound with "knotting" or with grafting wax. How hard a tree should be pruned will depend on the variety, "weak" growing should be pruned much harder than "strong" growing varieties. When a tree makes long strong shoots at the expense of fruit-bud formation, root pruning should be done. This is best done in November.

Dig a trench 2 or 3 feet from the stem and work with a fork well under the tree, cutting back the strong roots and severing the tap or main root, if any, close in, being at the same time careful not to injure the fibrous roots. The summer cultivation, syringing, watering, feeding, and the pinching back of those shoots which are too vigorous, should be to encourage clean healthy growth and the production of fruit buds.

Varieties of apples proved suitable for planting in the Midlands, are :—

DESSERT

Beauty of Bath.—Fruit small. Good colour and flavour.—July and August. Self-sterile.

Lady Sudeley.—Upright growth. Fine fruit.—August and September. Partly self-fertile.

Worcester Pearmain.—Upright growth. Fine fruit.—September and October. Partly self-fertile.

King of the Pippins.—Requires a warm soil.—October to February. Self-fertile.

Cox's Orange Pippin.—Requires a warm soil.—November to February. Self-sterile.

Scarlet Nonpareil.—A useful variety.—January to April.

Sturmer Pippin.—Another useful variety.—March to June. Self-fertile.

CULINARY

Pott's Seedling.—Free cropper, good quality.—August and September.

Ecklinville.—Compact, upright grower.—September and October.

Warner's King.—Free and vigorous grower.—October and November.

Prince Albert.—Spreading, moderate grower.—November to April. Self-sterile.

Bramley's Seedling.—Strong grower, free cropper.—December to April. Partly self-fertile.

Wellington.—Good cropper, fine fruit.—December to June.

Blenheim Orange will either do for dessert or cooking. The tree does not come into bearing so soon as many of the other varieties, but the older it gets and more pendulous the growth the better it crops.

The months mentioned after each variety of apple give the periods during which the fruit is available for use.

Some Useful Varieties of Apples.

These varieties can be grown as bush, pyramid, cordon, or standard. The fruit of the early varieties should be used as soon as gathered, if kept they crack and lose flavour. Do not gather late varieties too early or they will shrivel.

Apricot (*Prunus Armeniaca*, Syn. *Armeniaca vulgaris*). Natural Order *Rosaceae*.

The apricot is not at present very largely grown, but its cultivation ought to be encouraged. In many Oxfordshire villages fan-trained trees against cottages have luxuriated for years; but as the old trees die out very few new ones are being planted, and even those which are planted succumb to gumming in a very short time. This is due in a large measure to the stock on which they were worked being seedling plum, and perhaps also to too severe branch pruning.

The soil for apricots should be of a chalky character and not over rich in organic matter.

The trees should either be double budded or budded on to "mussel plum" and not seedling plum stock. Some bud on to plum and apricot stocks. Apricots do not often do much good when raised from seed unless they are budded. Autumn is the time to plant; and the south-west and south-east are the right positions for the trees to face.

Pruning should be done with great care, no hard cutting back. The fruit is borne on the previous year's shoots; therefore, in the early summer, rub off all misplaced shoots and those not required, and train in their full length what will be the fruiting shoots of the next year. If one or two shoots are extra vigorous, just pinch off the growing points. This will retard their growth and give the other shoots extra vigour.

The winter pruning will consist in taking out the old and naked shoots and shortening back those left to the well-ripened part.

Varieties. "Hemskerk" is a good early variety; "Moorpark" is considered the best mid-season variety and the one most suited to soils of varying character; "Peach" or "Grosse Pèche" is the best late variety.

Cherry (*Cerasus*). Natural Order *Rosaceae*.

There are districts in almost every county where cherries do exceptionally well and where they are grown in quantity.

For north walls and shady parts of buildings the "Morello" cherry can be successfully grown. The pruning required is the cutting out of the old wood and the training in of the new.

The "Sweet Cherry" does best in a sandy loam on chalk, and in an elevated situation. The propagation is by budding (a description of the operation will be given when the budding of roses is dealt with), for standards on the seedling cherry stock, and for bushes or dwarfs on the "Mahaleb".

The fruit is borne chiefly on spurs which come from the sides and ends of wood two or more years old.

Standard trees require very little pruning beyond the removal of badly placed and over-crowded branches.

Wall trees should be disbudded in spring of all shoots not required for laying in, and the winter pruning should consist of cutting hard back to within two or three buds of the branch all unfruitful, crowded, or useless shoots, thus preserving all the fruit spurs developing from these buds.

Varieties. "White Heart" or "Frogmore", "Bigarreau", and "Governor Wood", are good early varieties to grow and they do well either as standards or on a wall. "Waterloo", a Black Heart, is a good late variety to grow.

Currants (*Ribes*). Natural Order *Saxifrageae.*

The **Black Currant** (*Ribes nigrum*) is a most useful and accommodating plant. It succeeds well in low-lying, damp, and shady places, in soils rich in vegetable matter. It will also do well on higher and drier grounds and in a sandy loam. It is propagated by cuttings or well-ripened shoots of the current year's growth taken in November. The shoots should be straight and from 12 to 18 inches long, and shortened back to the plump, firm growth, making the cuts near to, but sloping at an angle of 45° away from the buds. After shortening back, leave the first five buds and take out the others with a sharp knife, finishing off with a right angle cut at the bottom of the cutting and just under where the last bud was taken out. Some do not think it necessary for black currant cuttings to be "eyed" in this way, but there is a great advantage in having all bush fruit trees on a single stem. The prepared cuttings should be planted on a north or shady border 4 inches deep, and in rows 12 inches apart, and 6 inches apart in the rows. The soil should have plenty of sharp sand mixed with it, and should be well trodden down and made firm. After twelve months' growth has been made transplant the strong plants 2 feet apart, and after another year or two's growth again transplant to 4 feet apart. The fruit is produced on the new wood, therefore the only pruning required is to cut out old, weakly, and immature growths, and encourage strong new shoots from the base.

"Seabrook's Black," "Boskoop Giant," "Baldwin's Black," and "Black Champion", are good varieties to grow.

The **Red Currant** (*Ribes rubrum*) and The **White Currant** (*Ribes album*), are propagated similarly to the black currant. A rich sandy loam is an ideal soil. The situation should be open and warm or sunny.

"The Comet," "Fay's Prolific," and "La Versailles", are good red varieties, and "White Dutch" and "White Grape" good white varieties. The pruning should be done as for the gooseberry.

Gooseberry (*Ribes Grossularia*). Natural Order *Saxifrageae.*

The gooseberry is propagated by cuttings in the same way as currants. A rich loamy soil is the best. Frequent syringing and occasional feeding with liquid manure through the summer keeps the foliage clean, and promotes growth of fruit and branch. The fruit is produced not only on the new or one year old wood, but also on shoots two or three years old and on the spurs springing from the sides of these shoots; but the new wood produces the finest fruit. For the first two years cut the young shoots or leaders hard back to form the head of the tree. In the summer keep the middle of the tree open by rubbing out those shoots not required, and by summer pinching, that is, nipping off the ends of the lateral shoots on the main branches which are to form fruiting spurs, when they are about 6 inches in length. Secondary growths will most likely start from the two end buds on these pinched shoots, but when the winter pruning is done in the following March, these lateral fruiting spurs will be cut back behind these secondary growths to the dormant buds. As space allows, new shoots to form leaders and to produce fruit spurs should be encouraged from the base of the tree.

Gooseberries do well when grown as cordons or trained trees on walls.

The following varieties can be recommended:—"Early Sulphur" and "Golden Drop" (yellow); "Lancashire Lad," "Whinham's Industry," "Crown Bob," and "Warrington" (red), for general use. While "Criterion", "Leveller", and "Trumpeter" (yellow); "Surprise," "Keepsake," and "Stockwell" (green); "Companion," "Lord Derby," and "Blucher" (red); and "Antagonist", "Postman", and "Princess Royal" (white), are varieties to grow for large berries.

Pear (*Pyrus communis*). Natural Order *Rosaceae*.

The pear is considered to require a warmer soil than the apple, with a more porous subsoil.

The best method of propagation is by grafting on to the "pear" and "quince" stocks; the former being suited for standard trees on very light soils, and the latter for pyramid and bush trees on heavy retentive soils. The propagation and treatment of the stocks, the methods of grafting and the general cultivation of the pear are very similar to those dealt with when describing the apple.

Some Useful Varieties of Pears.

The following are useful varieties of pears to plant :—

Doyenné d'été.—Fruit small. Free cropper. Does well grafted on pear stock.—July.

Jargonelle.—Growth rather drooping.—Very suitable for a standard.—August.

William's Bon Chretien.—Does well on most soils. Growth upright. Suitable for standard.—August and September.

Souvenir de Congrés.—Fruit large. Does well on the pear stock, and as a bush tree.—August and September.

Pitmaston Duchess.—Fruit very large. Tree a free grower and does well on almost any kind of stock.—October and November.

Beurre Bosc.—Spreading habit. Does well on stonebrash soil. Suitable for standard.—November.

Doyenné du Comice.—Upright growth. Suitable for bush. An excellent pear.—November and December.

Glou Morceau.—Spreading growth. Suitable for standard. Hardy and free bearer.—December and January.

Josephine de Malines.—Hardy and free bearer. Suitable for standard. Does well on stony soils.—February to April.

Beurré Rance.—Free grower. Should be root pruned to induce and keep it bearing.—December to March.

Marie Louise.—Requires a good soil. Spreading growth, Suitable for standard.—October and November.

Catillac.—Large round stewing pear. Suitable for standard. December to April.

These varieties will also do for trained trees or cordons on walls. Pears require gathering with great care, and should be stored in a warmer and drier atmosphere than apples.

Plum (*Prunus domestica*). Natural Order *Rosaceae.*

Plums, gages, and damsons do not require a very rich soil. A calcareous loam suits them well. When a soil is too rich in organic matter, bush plums especially make a superfluous amount of growth and have to be root pruned two or three times before they fruit freely. The best method of propagation is by budding on to seedling plum stocks. Trees grafted are liable to "gumming". Those plums raised by "layering" develop an abundance of suckers, which rob the soil of soluble plant food and cause much otherwise unnecessary work. When buying trees for planting, purchase those which are not more than two years old from the bud, for with plums as with other fruit trees, the younger the trees are the more quickly and kindly they take to the soil and become acclimatized.

The hardier varieties of plums like "Early Rivers", "Czar", "Pond's Seedling", "Emperor", and "Victoria", as well as the damsons, are generally grown as bushes and standards. While the better-flavoured or dessert varieties like "Jefferson", "Kirke's Blue", "Coe's Golden Drop", "Oullin's Golden Gage", and "Transparent Gage", are grown on walls either as cordons or espaliers. In pruning hard cutting back of large shoots aggravates "gumming". Crowded and badly placed branches can be cut out to keep the trees open. In trained trees secure the young spurs for fruiting; these develop on shoots from one to three years old.

Loganberry (*Rubus*). Natural Order *Rosaceae.*

This plant is a supposed natural cross between the blackberry and raspberry. The fruit is very much like a raspberry but larger in size and sharper in taste.

The plant is quite hardy and is easily propagated by "layering" the new or current year's shoots in August. It is of quick growth and fruits very freely. The pruning required is the cutting out of the old growths after fruiting, and tying in of the new shoots after shortening them back to the matured part. The plant can either be grown in rows like the raspberry, or on arches, fences and the like.

Raspberry .(*Rubus idaeus*). Natural Order *Rosaceae.*

The month of November is the best time to plant raspberry canes and for making new beds. The method of propagation should not be, as is too often the case, by division of the old roots or "stools", but by selecting the strong and well-ripened young sucker canes which grow singly near to the old plants. Plant these single canes in rows 6 feet apart and 18 inches apart in the rows, in a well-manured black loam, in a moist and rather shady part of the garden. After planting " mulch " with good rotten manure.

In the following March cut back these newly-planted canes to within 12 inches of the ground. Through the summer encourage free growth of three or four good strong canes, and not more, from each plant. These will be the fruiting canes the following year. The winter treatment will be to shorten back these canes a few inches to the well-ripened and plump wood, tie them in to wires or to a stake and then point or fork over, to a depth of not more than 2 or 3 inches, the soil between the rows and plants, and again give another good mulching of rotten manure well spread over the ground and not laid in heaps round the canes of each plant. The next summer again encourage about four canes, do not have too many or they will be thin and weakly, from each plant to take the place of those tied in, for after they have fruited the sooner they are cut out the better, so as to admit light and air to ripen the young canes for next year's fruiting. When canes are carrying large crops of fruit feed liberally with farmyard liquid manure. Frequent syringings through the summer, in the evening after a hot dry day, will do a great amount of good. The cutting out of the old canes after fruiting, shortening and tying in of the new ones, with the pointing and mulching of the ground are yearly operations.

Weeding and frequent hoeings through the summer will also be necessary.

The following varieties can be recommended, viz. " Bountiful," " Superlative," " Carter's Prolific," " Baumforth's Seedling," " Fillbasket," " Fastolf," and " Norwich Wonder ".

Strawberry (*Fragaria vesca*). Natural Order *Rosaceae.*

The life of a strawberry plant is not as a rule allowed to exceed three years, it is therefore very advisable to propagate each year one-third of the total number of plants needed. Select " runners " in June and July from the fruitful plants and take the first plant on each runner and peg them down into the ground near the parent plant, or into turves 3 inches square and placed grass side downwards, or else peg them into small pots, not more than 3 inches in diameter and filled with a compost of turfy loam, leaf mould, and sand. Always pinch off the tip of the runner beyond the " layered " or pegged down plant. Keep the layers well supplied with water till rooted. When well rooted plant out into a rich firm soil in rows 2 feet 6 inches apart, with the plants 2 feet apart in the rows.

Transplant with a trowel and keep as much soil on the roots as possible. Also be careful not to bury the crown or heart of the plant, yet at the same time do not leave the plants too far out of the ground.

Press the soil firmly round each plant. " Mulch " with rotten manure and keep the plants well supplied with water till established if the weather is hot and dry.

Pinch off all runners which are made after planting. The plants, if properly treated, should bear a nice crop of fruit the following year. When fruiting pinch off all runners if not required for propagation, as these rob the plants of food.

Feed the plants liberally with farmyard liquid manure to swell the fruit.

Put straw or lawn clippings round the plants to keep the fruit clean. After the fruit is gathered cut away the old leaves; fork over, 2 or 3 inches deep, the surface soil and then give the plants a good mulching of rotten manure.

The following varieties are of excellent merit, and are placed in the order of ripening:—" King George V," " Royal Sovereign," " Sir Joseph Paxton," " President," " Waterloo," and " Givon's Late Prolific ".

CHAPTER X

FRUIT-TREE PESTS

INSECTS

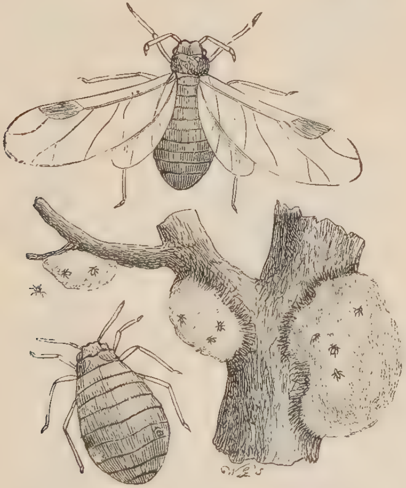
Aphides. These insects are better known as green and black fly. There are several species of the genus. Aphis, the green fly which attacks the apple is known as *Aphis mali*; that which attacks the plum as *Aphis pruni*; and the black fly which attacks the cherry is known as *Aphis cerasi*. These insects, of which there are winged and wingless forms, do injury to the young leaves and shoots by sucking out the sap. They increase in number with great rapidity and therefore should be dealt with as soon as observed.

An infusion of quassia chips mixed with soft-soap and applied frequently with a fine-rosed syringe will keep them in check. For black fly, which is more tenacious of life, syringe the trees with a liquid consisting of 1 wineglassful of paraffin to 1 gallon of water, in which 1 oz. of soft-soap is dissolved; keep the whole well mixed when using and apply in a fine spray.

Soap-suds are generally to be had and are of considerable value as an insecticide.

American Blight (*Schizoneura lanigera*). This insect is also known by some as the woolly aphis; being somewhat related to that genus. The insects attack the shoots and branches of young as well as old apple-trees, and are easily recognizable by the white fluffy or cotton-wool-like material with which they are more or less covered. They also attack the roots, producing knob-like excrescences. Keep a watchful eye on young trees, and on the first appearance of an insect soak it with methylated spirit put on with a small brush.

Where trees are badly infested cut away the branches and burn them, then rub gently, after cleaning off the loose bark, the shoots and branches left with a brush moistened in paraffin ; do this in winter and be careful not to injure the buds. White-washing the trees in winter and syringing them in summer with paraffin emulsion is to be recommended.



American Blight (*Schizoneura lanigera*).
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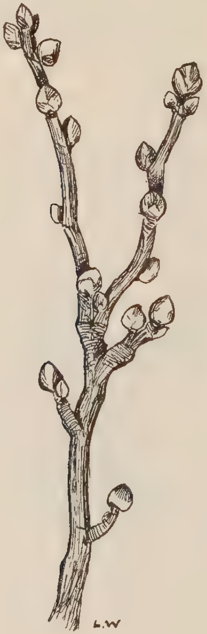
Bud-Mite—The Currant-Bud Mite (*Phytoptus ribis*). When this insect, which is of microscopic size, gets into the buds of the black currant irreparable damage is done. The buds swell to a large size, but never properly open. Shoots and branches infested with the " big bud ", as it is often called, should be cut out and burnt.

The Codlin Moth (*Carpocapsa Pomonella*). Almost every one is familiar with the maggot which brings down large quantities of apples year after year, long before they are ripe. The moths appear in June and July. The female moths will lay an egg, usually but not always, in the eye of the young fruit, which is at this time in an upright position. After the maggot is hatched out, it eats its way inside and through the fruit to find a place to make a cocoon and pass the winter.



Buds of Black Currant infested with Mite.

Healthy Buds.

The infested apples should either be given to the pigs or burnt. Keep the trees healthy and clean by syringing in summer with quassia extract, and in February and November with an alkali wash made of ½ ℔. of caustic soda, ½ ℔. of commercial potash, ¼ ℔. of soft-soap to 5 gallons of water.

The Lackey Moth (*Bombyx neustria*). The eggs are laid in rings closely packed together on the young shoots and branches of the apple and pear. The caterpillars are of many colours and make their appearance during early summer, living in colonies, when not out feeding, of from 50 to 200 under a weblike structure which they construct. They go out to feed on the leaves at night. Wherever rings of eggs are found they should be destroyed. Summer and winter dressings as already recommended are useful.

The Magpie Moth (*Abraxas grossulariata*) has more or less the colourings and markings as the name implies. The caterpillar is a "looper", that is, it forms loops when walking. It passes the winter in a larval condition; therefore as soon as the leaves appear on the gooseberry bushes, to which tree it gives special attention, it begins to feed on them. Dress the trees and soil in winter with lime and soot. Hand picking of the caterpillars is the surest, but is a tedious way of getting rid of them. Syringe the trees when in leaf with soap-suds, quassia wash, and a wash made of 1 oz. of soft-soap, a wineglassful of carbolic acid (Calvert's No. 5), to 1 gallon of water; this we have found most effectual in destroying the caterpillars.

The Gooseberry and Currant Saw-fly (*Nematus ribesii*) increases with such rapidity that there are several broods of caterpillars in a season. The larva can be distinguished from the caterpillar of the Magpie Moth by having more legs. The remedies recommended for the Magpie Moth will apply here.

Scale (*Aspidiotus conchiformis*), or **Mussel Scale,** is sometimes seen to cover the main stems and branches of apple-trees.

It would not pay to cleanse trees very badly attacked with this pest, it would be better to burn them.

In mild cases the scraping of the bark with a blunt knife or washing the stems with soft-soap, paraffin and water, will pay for doing.

There are numerous other insect pests which attack fruit trees; for particulars of which see the leaflets issued by the Ministry of Agriculture and Fisheries, which can be had post free on application.

DISEASES

Canker (*Nectria ditissima*). Unsuitable soil, subsoil, and situation, sudden check to growth due to climatic changes, insect attacks, and severe and improper pruning all tend to produce cracked and decayed bark, and so tends to give the spores or seeds of the disease easy access to the living part of the tree. Upon the first appearance of decaying bark cut away and burn it, wash the wound with paraffin, then dress it with Stockholm tar or a grafting wax, or some other composition to prevent the invasion by disease and to help the healing of the wound. The apple is the principal host for this disease.

Leaf-curl or Blister (*Exoascus deformans*). This disease is undoubtedly most prevalent when the young leaves are checked in growth by sudden climatic changes (hot days and cold nights). Peach-trees on walls running east and west often suffer much in the spring of the year from this disease. Pinch off and burn the diseased leaves. Syringing with "Bordeaux mixture" just as the leaf buds expand is recommended.

Mildews. There are many kinds of mildews which attack the leaves and stems of fruiting plants, all of which, if taken in time, can be effectually destroyed by syringing the affected parts with sulphide of potassium, ½ oz. to 1 gallon of water in which 1 oz. of soft-soap is dissolved, or by dusting with flowers of sulphur.

Scab or **Spot** (*Cladosporium* or *Fusicladium*). The fungus which attacks the leaves and fruit of the apple is called *C. or F. dendriticum*, and that which attacks the pear, causing the fruit to crack, is called *C. or F. pirinum.*

The disease is in some seasons very prevalent and spoils the fruit.

Prevention is better than cure. Therefore adopt good cultivation of the trees, frequent syringings through the summer with quassia wash, and on the first appearance of this fungus syringe with weak "Bordeaux mixture", made by dissolving 1 ℔. of sulphate of copper in hot water in a wooden vessel, adding ½ ℔. of quicklime and making up to 15 gallons with water.

Burn diseased fruits and leaves.

Many other diseases attack fruit, most of which can be kept in check by cultivation, free circulation of air, and an abundance of water in a dry summer not only at the roots but overhead. Never be afraid of giving the trees a cold-water bath by means of the syringe or hose pipe.

CHAPTER XI

FLOWERS

THE plants suitable for cultivation in the garden and schoolroom will also be useful when giving lessons in Nature Study.

Only a few will be dealt with, and these alphabetically.

China Aster (*Callistephus sinensis*). Natural Order *Compositae.*

This is half-hardy and is propagated by seed.

For early blooming sow the seeds on a hotbed or in a greenhouse in March; when the plants are large enough to handle prick out to 6 inches apart into boxes or a cold frame, which should be filled with a compost of decayed manure, leaf mould, sifted loam, and sand.

Shade the plants from the sun till rooted, then admit air on all favourable occasions so as to thoroughly harden them off for planting outside in May. Close the frames early in the afternoon and protect from frost at night by covering with mats or straw. Grow the plants as hardy and "stocky" as possible. Successional sowings can be made outside in April. Oftentimes from this sowing good plants are produced which give an abundance of bloom late in the season. Sow the seed in a rich soil thinly in a shallow drill, prick out the young plants early and transplant, finally giving the plants at least 12 inches of room in a well-manured soil. Some plant out direct from the seed-bed to blooming quarters, but this should not be done if it can be avoided. Through the summer keep the ground clear of weeds by hoeing, and the plants well supplied with moisture, and when the air is hot and dry syringe frequently overhead. Occasional waterings with soot-water, made by putting a gallon by measure of soot in a canvas or coarse bag, placing this in a large barrel or water-butt filled with 15 to 20 gallons of water, will do a great deal of good.

After the buds are formed " mulch " between the plants with decayed manure, *not* new manure, and feed with farmyard liquid manure. To 1 gallon of the liquid manure should be added 6 gallons of water.

There are many classes of asters, and various colours in each class, all of which under good cultivation give satisfactory results.

We may mention the " Dwarf " (chrysanthemum flowered), the " Peony " flowered, the " Victoria " (quilled florets or petals), the " Comet " (Japanese chrysanthemum type), which are most useful for cut blooms.

Carnation (*Dianthus Caryophyllus*). Natural Order *Caryophyllaceae.*

This is considered the parent of the "Malmaison", the "Tree" ("Perpetual," "Winter," or "American"); the "Flake", with two colours only, one the ground colour and the other in strips or stripes along the petals from centre of bloom to the circumference; the "Bizarre", with a ground colour and two or three other colours arranged in spots and stripes; the " Picotee ", with a ground colour edged with a thin or thick band of another colour ; the " Border Carnation " or " Pink ", and the " Carnation Marguerite ", the two latter in self and fancy colours. The " Malmaison " and " Tree Carnations " are grown under glass. The " Carnation Marguerite " is raised from seed and is grown as an annual. Sow the seed on a hotbed or in a heated greenhouse in February and March. When the plants are large enough to handle prick off into boxes or small pots filled with a mixture of equal parts of loam and leaf mould and about an eighth part of coarse sand. Plant out of doors in April and May for autumn blooming. A sowing can also be made out of doors in April, thinning out the plants to 1 foot or 18 inches apart; these plants if lifted and potted in September and put into a greenhouse will give a display of bloom through the winter. Keep the plants neatly staked and give air on all favourable occasions.

The other kinds of carnations are propagated by "layering", "cuttings", and "pipings", during July.

For layering select non-blooming shoots, not too old and woody nor too young and sappy. About 3 inches from the top of each shoot strip off a few leaves; then with a sharp knife make a cut through the stem about an inch long, starting midway between two joints and finishing midway between the next two joints; peg down into a firm soil similar to the one previously mentioned, with lime rubble added, by means of hairpins or hooked sticks made thus ˥ from pea-sticks or twiggy shoots. Keep the "tongue" open or the cut parts will grow together again. Some consider the shortening back of the tips of the leaves favourable to root formation.

The rooted layers of border or open-air carnations can be planted out into permanent places either in September or March and April, or they can be potted in September and stood in a cold frame through the winter and then planted out in March or April.

The rooted layers of indoor carnation-cuttings of the winter flowering carnations should be taken in January and February, and should be potted up as soon as possible to get well-established plants before winter.

The propagation by "cuttings" and "pipings" is done in July. Select for cuttings non-blooming shoots 3 or

4 inches long, strip off a few leaves at the base and make a square cut just under a joint.

A piping is made by pulling the young shoots out at a joint, which leaves a hollow bit of stem, then pulling off a few leaves at the base and inserting them without making a cut under a joint, bud or node.

They can be easily rooted either in a cold frame or shady border; the former is preferable. Prepare a mixture as advised for layering and place it in the bottom of a one- or two-light frame; tread it firmly down, and if at all dry give a watering through a fine rose some few hours before inserting the cuttings or pipings. These should be put in 6 inches apart with a small dibber, then lightly sprinkle overhead, and put on the lights and shade from the sun. Air should be admitted in the morning to carry off the superfluous moisture condensed on the inside of the glass.

When rooted, encourage stocky growth by admitting plenty of light and air, and plant out into the open either in autumn or spring.

The following list may be useful to those who would like to grow named sorts.

Scarlet and Crimson Bizarres.

Admiral Curzon.
C. F. Thurstan.
Charles Turner.
Harison Weir.

Pink and Purple Bizarres.

Autocrat.
Sir Garnet Wolsely.
Sarah Payne.

Scarlet Flakes.

Flamingo.
Richard Dean.

Purple Flakes.

Charles Harwood.
James Douglas.

Rose Flakes.

Sybil.

Thalia.

Picotees.

Brunette and Monarch, red edged.

Amy Robsart and Mary, purple edged.

Edith D'ombrain and Madeline, scarlet and rose edged.

Lady St. Oswald, ground colour yellow, and margin of petals red.

Lord Napier, ground colour yellow, with a narrow rose edge.

Pinks.

Albino, white.

Bertha, dark red.

Charles, pink.

George, white, purple.

Mrs. Sinkins, white.

Border Carnations.

Benbow, buff.

Cecila, yellow self.

Crimson clove, well known.

Germania, yellow self.

Purple Emperor.

Albion, white.

Bridegroom, pink self.

Mephisto, crimson.

Roy Morris, scarlet.

Liberté, fancy.

Chrysanthemum (*C. indicum* and *C. sinense*). Natural Order *Compositae.*

From these two species we have got the indispensable perennial chrysanthemums for autumn and winter blooming.

Though they can be easily raised and grown from seed, the more usual way is to take cuttings, which can be done any time between November and March, and which are "struck" in a greenhouse.

The early-blooming varieties are easy of propagation and cultivation, and give an abundance of bloom from August till November out of doors. Procure in January or February some good strong root-cuttings 3 to 4 inches long and without bloom buds ; strip off a few leaves at the base and make a square cut just under a bud. Fill well-drained pots or boxes with a mixture of equal parts of sifted loam and leaf mould and one eighth part of coarse sand, press firm and cover eighth of an inch deep with sharp silver sand. Cuttings put into pots should be put round the side and not in the middle. Make a hole with a dibber, place a little sharp sand at the bottom, on which put the cutting and press the soil firmly against it. After the cuttings are inserted, water through a fine rose watering-can and shade from hot sunshine to avoid " flagging ". It is a good plan to stand the pots of cuttings in a deep box, over which place a sheet of glass and cover during the day with brown paper. Every morning take off the sheet of glass and wipe off the condensed moisture, then replace it and shade. A little air during the night is generally advisable.

As the cuttings make root admit gradually more light and air till well rooted, when they can be stood on a shelf in the greenhouse to ensure stocky growth. When the roots protrude through the bottom of the pot they can be potted off singly into pots about 3 inches in diameter.

Shade in sunshine to prevent flagging ; and when rooted pinch out the top of the shoots, which will cause side growths. When these 3-inch pots are full of root, pot up again into pots 5 inches in diameter. Keep the plants slowly growing, hardening them off ready for planting outside in April.

Plant them out carefully 3 to 4 feet apart into well-manured ground ; stake and tie up the shoots against strong winds.

Through the summer keep the ground free from weeds and the plants well supplied with moisture both at the root and overhead. Feed with farmyard liquid manure and soot-water, and when the bloom buds are formed mulch the plants with good rotten manure. The propagation of these outdoor chrysanthemums by dividing the stools or roots in March and April is often done where there is no convenience for rooting cuttings or raising seed.

Do not leave more than two or three shoots to a root, and plant into well-manured ground.

If the shoots are of any great length they can be topped and the tops rooted in a shady place in the open ground and potted up in September for indoor decoration. Window boxes may be filled with these cuttings, judiciously arranging them as to heights and colours. Bring the boxes indoors towards the end of September or the beginning of October.

The following are useful varieties for outdoor cultivation :—

Japanese section.

Crimson Marie Massee.
Goacher's Crimson.
Goacher's Pink.
Golden Queen of the Earlies.
Harvest Home, red.
Horace Martin, yellow.
White Queen of the Earlies.
Madame Desgranges, white.
Ryecroft Beauty, pink.
White Massee.

Single section.

Elegance, chestnut red.
Mrs. C. Curtis, crimson.
Majestic, red.
Philadelphia, pink.
Rainbow, lilac.
Canada, salmon.
Chastity, pure white.
Colin Cooper, yellow.
Daisy Bell, blush.
Jupiter, white.

Pompon Section.

Flora, golden yellow.
Lyon, rosy purple.
Martinmas, blush pink.
Mr. Selley, rosy pink.
White Lady, white.
Toreador, reddish bronze.

Coreopsis, also known as **Calliopsis**, Natural Order *Compositae.*

All the varieties are hardy annuals; with the exception of *C. grandiflora,* which is a perennial.

Sow the seed in March and April, very thinly in shallow drills, and plant out into borders and beds of good soil when a few inches high, giving each plant at least 18 inches of space. The plants will grow from 12 to 36 inches high; the former will come under the dwarf section and the latter under the tall section.

The predominating colours of the flowers are either yellow and brown or crimson and gold, and they are very useful for cut bloom for decorative purposes.

Cornflower (*Centaurea*). Natural Order *Compositae.*

This hardy annual of many colours is most useful as a cut flower for decorative purposes.

Sow the seed in March and April, thinly in shallow drills, and transplant to final quarters as soon as the plants are large enough to handle.

Give each plant at least 12 inches of space.

Dahlia (*Dahlia variabilis*). Natural Order *Compositae.*

This useful plant, which has now many sections or types, is named after Dahl, a great Swedish botanist. It was brought from Mexico about the year 1760. It is easy of cultivation, either from seed or cuttings; the latter of which are taken from the tubers started into growth by a little artificial heat in the greenhouse or frame during February or March.

Do not propagate too early, for the plants cannot safely be put out of doors until the last week in May or the first week in June. If you propagate by seed sow either in a heated frame or greenhouse any time during March; sow very thinly in pots, pans, or boxes, drained and then filled with a compost of equal parts of sifted loam and leaf mould, with a little silver sand added to make the mixture warm and porous. When the plants are large enough to handle prick out into other boxes, giving each plant 6 inches of room, or pot off singly into pots 3 inches in diameter, using a similar mixture to above. Place in the greenhouse till well rooted, when a second potting should be done into pots 5 or 6 inches in diameter, using a mixture of turfy loam two parts, leaf mould one part, and sufficient sand to leaven the whole. Put them in a frame or greenhouse or the schoolroom, water carefully, protect from frost, and give plenty of air; growing them sturdily till the weather is fit for planting outside. If there is no convenience for rooting cuttings, the dahlia roots may be divided while dormant and planted outside the first week in May.

The soil outside into which they are to be planted should be well manured; give each plant 4 feet of space and stake against strong winds. On light soils plant deep and leave the ground round each plant hollowed out like a basin, to be filled frequently with water and liquid manure in a dry summer to promote vigorous and healthy growth.

When the weather is hot and dry syringe the plants overhead daily. Fill the basins gradually with decayed manure and leaf mould as the roots appear on the surface of each dressing. A great deal of feeding should not be done till the bloom buds are formed.

When the tops of the plants are blackened, or cut off by the frost, cut the stems to within 9 inches or so of the soil, lift the tubers if they are to be kept for stock from which to take cuttings another year, shake off the soil, dry thoroughly, and store through the winter in a cellar or loft, or in any frost-proof place.

It is not a good plan to plant the old "stools" with their many tubers year after year.

A dahlia should only have one main stem from the root, and not five or six or more as is so often seen; this one stem will send out side shoots to form a bushy plant which will produce an abundance of good quality blooms.

The propagation of named sorts of dahlias is done by taking cuttings from the tubers which are started in a heated frame or greenhouse, when they are about 3 or 4 inches long, with a little of the old tuber or heel attached; put them singly into thumb pots well drained and then filled with a mixture of soil as recommended for the seed to be sown in. Water through a fine rose and put in a heated frame or greenhouse. Shade for a few days to prevent the leaves drooping or flagging. When rooted pot off and treat as recommended for seedlings.

The following sections or types and varieties of each may be useful to those who wish to grow named sorts.

Show and fancy—

John Walker, white.
Diadem, rich crimson.
Julia Wyatt, creamy white.
W. Powell, primrose.
Edward Mawley, deep crimson.
Modesty, blush.
Dazzler, yellow, striped scarlet.
Valentine Humphreys, buff coloured, tipped white striped purple.
Lottie Eckford, white, tipped with purple.
Mrs. Langtry, cream, edged crimson.
Matthew Campbell, apricot, striped with crimson.
Rev. J. B. M. Camm, yellow, flaked red.

Cactus—

Union Jack, bright red, shaded and tipped white.
Alabaster, white.
F. W. Fellows, apricot.
John Riding, rich crimson.
Esther, rose pink.
R. Box, light yellow.

Pompon—

Daisy, amber and salmon.
Bob, yellow, edged scarlet.
Queen of Whites, white.
The Duke, velvety crimson.
Amelia, pale pink, white centre.
Ideal, yellow.
Mars, crimson.
Hecla, white.
Maisie, silvery mauve.
Purple Gem, purple.
Douglas, dark maroon.
Norah, yellow, edged scarlet.

Peony-flowered—

Baron de Grancy, white.
Mozart, crimson.
King Leopold, canary yellow.
Eunice, rose.
Queen Wilhelmina, white.
Paul Kruger, striped white and rose.

Single—

Albatross, white.
Leon, scarlet.
Darkness, a dark maroon crimson.

Huntsman, orange-scarlet.
Alice Seal, deep crimson, shaded with scarlet.
Leslie Seal, silvery lilac, broad disc of crimson.
Mikado, scarlet centre with margin of clear yellow on tips of florets.
Amy, terra-cotta.
Beacon, yellow.
Princess of Wales, soft pink.
Snowdrop, a beautiful white.

Rose (*Rosa*). Natural Order *Rosaceae*.

No garden, however small, can be considered complete without roses; it is therefore necessary even in a book on School Gardening to give a few hints on their cultivation.

Situation and Aspect. All kinds of roses like sun and air, and all kinds dislike draughts, high or strong winds, cold winds, and a close, stuffy atmosphere. A south, south-east, or south-west aspect will suit them well; but protect them from the north, north-east, and easterly winds. Where it is impossible to have natural shelter, temporary protection may be given when needed by using hurdles with Archangel mats, &c.

Soil. Prepare the ground in early autumn by trenching or deep digging and manuring with decayed farmyard manure. Cow manure is excellent for chalky and light soils, especially so if Tea roses are to be grown. A deep rich retentive loam, a soil which will not get quickly hot and quickly cold, nor dry and then wet. Rapid fluctuations in temperature and humidity should be avoided.

Selection. When buying trees study your requirements for time of blooming, places where they are to be grown, and, above all, get young healthy trees which have been properly pruned and trained and budded or grafted on to suitable stocks for your soil.

Planting. This should be done in November or December, though through force of circumstances it may be done any time between October and March. When the plants ordered arrive, unpack carefully ; use especial care with standards so as not to break the branches ; examine the roots and cut away those which are bruised, and shorten back the long strong ones which are without lateral rootlets to about half their length. Do not allow the roots to be exposed to the air for any length of time ; the sooner the planting is done after the trees are unpacked the better. If the roots are very dry soak them in water before planting. Do not plant too deeply, the depth which the plant was previously planted will be seen by the earth-mark on the stem.

For standard trees the approximate depth would be 5 inches, but for dwarf or bush trees the union where budded should be buried about 2 or 3 inches under the soil.

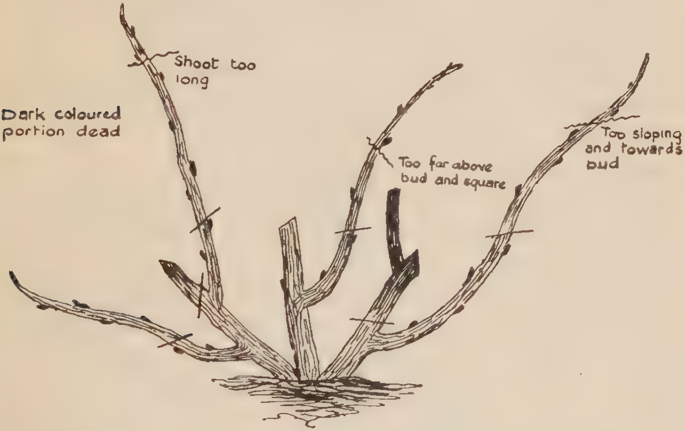
Make the holes sufficiently wide for each root to be spread out its full length. Roots should not cross each other or be twisted or bent.

If any farmyard manure is to be used at the time of planting the trees place it at the bottom of the holes; tread firmly down and then cover with 2 or 3 inches of soil, finishing off in the form of a mound.

Do not allow any rotting organic manures to be placed in contact with the roots.

Plant the trees in the centre of the holes and fill in between and over the roots with fine soil, not too much, just sufficient to cover the roots ; then give the trees a shake to settle the soil between the roots, followed by a gentle treading ; then add another layer of soil and tread again ; do not fill up the holes before making the soil firm. Firm planting is very important, and the only way to do it properly is to fill up the holes by putting in the soil in layers and treading each layer firmly down; the drier the soil the more firmly will it want treading. Finish the planting by mulching with 2 or 3 inches of manure to protect the roots from frost.

Standard trees when planted should be staked, and the very long shoots on dwarf trees should be shortened back about half their length.


Shoot too long
Dark coloured portion dead
Too far above bud and square
Too sloping and towards bud

Rose Pruning.

Pruning. This operation may be done about the last fortnight in March for Hybrid Perpetual roses, and the first fortnight in April for Tea roses.

Start by cutting out all dead and old wood and unripened and very weak shoots. Shoots growing into the middle of the trees should be cut hard back.

It is well to note that roses bloom on one-year-old wood.

The shoots of weak-growing varieties of Hybrid Perpetuals require pruning back to three or four eyes, while the shoots of strong-growing varieties would be left with five or six eyes.

Always make clean sloping cuts, to slope from the bud and with the bud pointing away from the centre of the tree.

Climbing and Pillar roses only require the dead wood and weak shoots cut out and the ends of the long shoots shortened back.

Use a good sharp knife in preference to a pair of secateurs, the cuts are cleaner and there is little or no danger of the wood being bruised.

Do not prune during severe frosty weather.

Disbudding the Shoots. When the plants start into growth rub out those shoots which are badly placed or are not required.

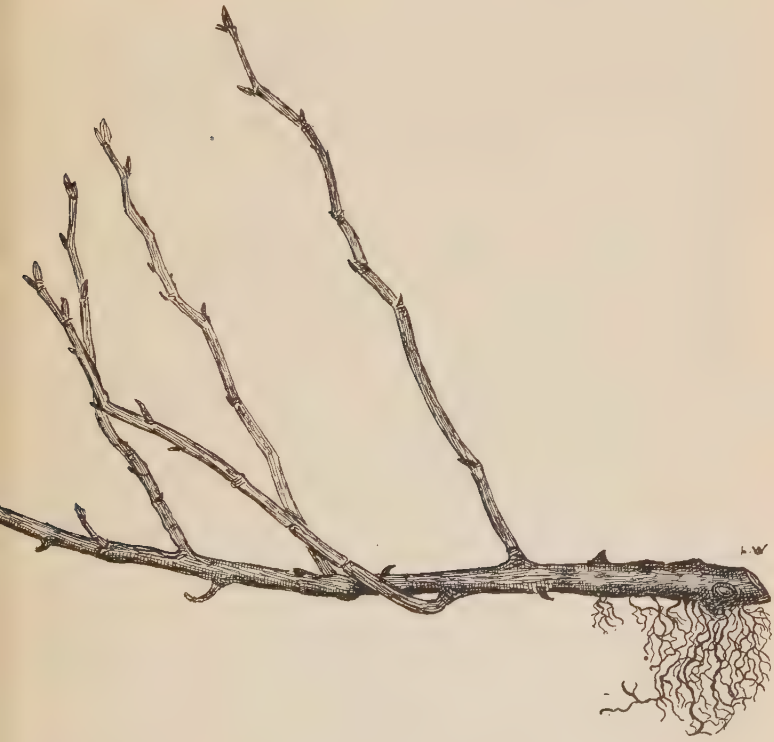
Cultivation. During the summer keep the foliage clean and healthy by frequent syringings overhead with soft-soap-and-water or with quassia extract.

In hot dry weather syringings with clear water daily will do a lot of good. The winter mulchings should not be dug in after the pruning of the trees so deeply as to destroy the roots. When the bloom buds are formed mulch the trees with decayed manure and feed liberally with farmyard liquid manure.

Propagation. Roses are propagated chiefly by layering, cuttings, and budding.

For layering, the shoots should be growing near the ground so that they can be easily pegged down. This should be done in August and September. Climbing roses and many Hybrid Perpetuals and Teas are easily propagated by cuttings.

Matured shoots which have flowered can be taken any time from July to November, and should be from 9 to 12 inches in length. Shorten back the ends to the well-ripened wood, making a sloping cut away from the bud; the base of the cutting, if it is not taken with a heel, should be cut square just underneath a bud. The cuttings will root under a north wall or in almost any position if not too sunny. Mix with the soil plenty of coarse sand; then tread firm and put in the cuttings, either with a dibber or in a trench made by the spade,



Layer of Rooted Rose-shoot.

6 to 9 inches deep, in rows 12 inches apart, and the cuttings 6 inches apart in the rows. Tread the soil firmly round the cuttings.

The cuttings should be sufficiently rooted by November twelvemonth to be ready for transplanting into permanent places.

Budding is considered far preferable to cuttings, especially for Hybrid Perpetuals and Teas. Various kinds of stocks are used: for cold late districts the "Manetti", an Italian rose; and for the midland and southern counties either the brier cutting or brier seedling.

On heavy retentive soils, and for dwarf trees, use the brier "cutting"; for the chalky, sandy, and stonebrash soils, and for standard trees, use the brier seedling.

July and August are the months in which to bud; the exact time will depend on the season.

For standard roses get young healthy briers from the hedgerows in November, trim up the roots and shorten back the tops to the required height, and plant in rows 2 feet apart and the briers 1 foot apart in the rows.

When they begin to grow select not more than three shoots on each brier, and these the strong vigorous shoots which are growing upright, rub off all others.

Where only a few briers are grown they can be encouraged to make strong healthy growth by watering and feeding and frequent syringings overhead; for root formation depends on the work of the leaves.

When these young shoots are ready for budding, which is when the bark separates easily from the wood, which is said to be when the prickles easily separate from the bark at the base of the shoot; procure buds of good varieties to put in from the current year's blooming wood. The buds selected should not be too advanced —these are found at the base of the shoots; nor too sappy and immature—these are found towards the end of the shoots.

Buds from near the middle of a shoot which has flowered are generally chosen.

To take out the bud turn the shoot with the point of the bud facing you; first cut off the leaf, leaving only about an inch of the leaf-stalk or petiole so as to handle the bud; then with a sharp budding knife start about half an inch below the bud and cut inward and upward so as to come out about half an inch above the bud, the shape of the cut being in the form of a shield; then reverse the position and hold the bud firmly between your thumb and finger, put the point of the knife between the wood left in the bud and the inner bark, and with a sharp jerk and a twist of the knife this superfluous wood should come out easily and without pulling out the eye of the wood. If the operation is successfully performed put the bud into water or keep moist till the brier is prepared for its reception.

In preparing the brier make an upward cut from as near the joint of the new shoot with the brier as possible, and about an inch in length; do not cut too deeply, but just through the barks; at the top make a right-angle cut so as to form a T shape; then open the bark with the handle of the budding knife by pressing gently first on one side and then on the other. Slip in the bud from the top and push well down to the base of the cut; the bark which extends beyond the T cut off with a sharp knife.

Bring all the cut parts well together by binding with a broad piece of raffia. The end of the shoot can either be shortened a little or broken halfway through, but do not cut it hard back. Many prefer buds inserted to lie dormant till the following spring, for young growth made in the autumn is in danger of being destroyed or injured by frost. The harder the budded shoot is cut back the greater the stimulus for autumn growth.

On hot sunny days keep the buds moist by shading with a cabbage leaf or a little moss put over them, which should be kept damp. When growth takes place do not allow the buds to be strangled, but undo the raffia and re-tie.

Boys Budding Roses.

The following is a short list of useful roses suitable for dwarfs and standards.

Hybrid Perpetuals—

A. K. Williams, carmine red.
Hugh Dickson, crimson.

Frau Karl Druschki, snow white.
Mrs. John Laing, pink.
Her Majesty, pink.
Marie Baumann, red.
Candeur Lyonnaise, white.
Prince Camille de Rohan, dark crimson.

Hybrid Teas—

Viscountess Folkestone, creamy white.
Lady Pirrie, coppery pink.
Mrs. W. J. Grant, rosy pink.
Madame Abel Chateney, carmine shaded salmon.
Killarney, flesh, shaded white, suffused with pink.
Ophelia, salmon flesh.
General Macarthur, crimson.
Gorgeous, orange yellow.

Teas—

Anna Olivier, flesh colour, suffused with apricot.
Lady Hillingdon, apricot yellow.
Mrs. Herbert Stevens, white.
Lady Roberts, orange to coppery red.
Lady Plymouth, ivory cream.
Maman Cochet, rosy pink.
Marie Van Houtte, lemon yellow petals edged with rose.
Mrs. E. Mawley, bright carmine.

For climbers on pillars, arches, and walls, the following are suitable.

Polyantha section—

Aglaia, bright yellow.
Blush Rambler, blush.
Crimson Rambler, crimson.
Shower of Gold, pink.
Thalia, white.
Braiswick Beauty, satiny rose.

Various—

Dorothy Perkins (Wichuraiana section), shell pink.
Reine Marie Henriette (Hybrid Tea), cherry carmine.
William Allan Richardson (Noisette), orange yellow.
Rêve d'Or (Noisette), deep yellow.
Maréchal Niel (Noisette), golden yellow.
Gloire de Dijon (Tea), yellow, shaded salmon.
Céline Forestier (Noisette), pale yellow.
Aimee Vibert (Noisette), pure white.

Sweet Pea (*Lathyrus odoratus*). Natural Order *Leguminosae.*

Sweet Peas delight in a deep rich soil, therefore trench or dig deeply the ground in winter; leave the soil rough or lumpy so as to be broken down by the winter frosts. Heavy retentive soil should be manured now with strawy manure, followed by a dressing of quicklime spread over the ground at the rate of from 14 to 28 ℔. per pole.

Light soil after trenching or digging should have a dressing of equal quantities of kainit and basic slag, 4 oz. to the square yard. In the spring, about a fortnight before the seed is sown, the heavy soil should be forked up and the lumps broken down; the light soil should be re-dug, adding plenty of decayed manure and leaf mould. Whether the seed is sown in clumps or rows is of insignificant importance, compared with the quality of seed you sow and the way you sow it. The seed should be sown in March or April 2 inches deep, and from 3 to 6 inches apart; if the birds are troublesome when the shoots come up put several strings of black cotton along the rows and some bushy twigs to the plants, and dust old soot over them when wet with dew.

The sooner the plants are staked the better. When the buds are formed mulch with horse-droppings and feed with farmyard liquid manure or some good chemical manure. Keep the plants well supplied with water both at the root and overhead : rain-water should be used. Cut the blooms early in the morning as they open, for if they are allowed to seed the plants stop flowering. The following are good varieties to grow :—

Black Knight, deep maroon.
King Edward VII, the finest crimson.
Lord Nelson, the finest blue.
Dorothy Eckford, white.
Lady Grizel Hamilton, lavender.
Constance Hinton, white.
Elegance, silvery pink.
Barbara, orange pink.
Edward Cowdy, orange scarlet.
Charity, crimson.
R. F. Felton, lavender.
Adelaide, purple.
Mrs. Tom Jones, blue.

Common name	*Botanical name*	*Natural order*	*How propagated*	*When propagated*
1. Anemone	Anemone fulgens	Ranunculaceae	Tubers	Autumn
2. Columbine	Aquilegia	Ranunculaceae	Seed	April
3. Aralia	Aralia Sieboldii	Araliaceae	Notching and seed	Spring
4. Aspidistra	Aspidistra lurida	Liliaceae	Division	Spring
5. Aucuba	Aucuba Japonica	Cornaceae	Cuttings	Spring
6. Bridal Wreath	Francoa ramosa	Saxifragaceae	Seed and division	Spring
7. Cactus	Cactus	Cactaceae	Cuttings & slips	Spring and Autumn
8. Clematis	Clematis Jackmanni	Ranunculaceae	Cuttings & layers	Autumn
9. Daffodil	Narcissus Pseudo-Narcissus	Amaryllideae	Bulbils	November to February
10. Everlasting	Helichrysum	Compositae	Seed	Spring
11. Gaillardia	Gaillardia grandiflora	Compositae	Seed	Spring
12. Goat's Rue	Galega officinalis	Leguminosae	Division	Spring
13. Grevillea	Grevillea robusta	Proteaceae	Seed	Spring
14. Gypsophila	Gypsophila paniculata	Caryophyllaceae	Division	Spring
15. Hollyhock	Althaea rosea	Malvaceae	Seed	Summer
16. Honesty	Lunaria biennis	Cruciferae	Seed	Summer
17. Honeysuckle	Lonicera Periclymenum	Caprifoliacaeae	Cuttings & layers	Autumn
18. Hyacinth	Hyacinthus	Liliaceae	Bulbils	November to February
19. India-rubber	Ficus elastica	Urticaceae	Cuttings & nodes	Spring
20. Iris	Iris (various)	Irideae	Division or bulbs	Spring
21. Jasminum	Jasmine officinale	Oleaceae	Layers	Autumn

REMARKS

1. Blooms in spring. Colour, red. Useful also for pot culture.

2. Blooms in summer. Colour, various. Suitable for beds and borders.

3. Sometimes called, but wrongly, the Caster Oil plant. Useful foliage plant for schoolroom.

4. Useful foliage plant for schoolroom.

5. Variegated foliage plant. Known by many as the Variegated Laurel.

6. Blooms in summer. Colour, white. A useful plant for cut bloom.

7. Blooms, various times. Colour, various. A useful class of plants for a schoolroom.

8. Blooms in summer. Colour, blue. Prune back each spring the old shoots.

9. Blooms in spring. Colour, various. Plant 4 to 6 inches deep.

10. Blooms in summer. Colour, various. Indispensable for winter decoration.

11. Blooms in summer. Colour, scarlet and yellow. Suitable for border.

Hardiness of plant	*Duration of plant*	*Nature of plant*	*Soil required*	*Distance apart to be grown*	*Approx. height of plant*
1. Hardy	Perennial	Tuberous	Ordinary	1 foot	1 foot
2. Hardy	Perennial	Herbaceous	Sandy loam	3 feet	3 feet
3. Half-hardy	Perennial	Foliage	Peat, loam, and sand mixed	Pot plant	3 feet
4. Half-hardy	Perennial	Foliage	Calcareous loam	Pot plant	1 foot
5. Hardy	Perennial	Shrub	Loam	4 feet	2–5 feet
6. Half-hardy	Perennial	Flowering	Sandy loam	Pot plant	1 foot
7. Half-hardy	Perennial	Succulent	Calcareous loam	Pot plant	Various
8. Hardy	Perennial	Climber	Loamy	For walls, &c.	—
9. Hardy	Perennial	Bulbous	Ordinary	1 foot	1 foot
10. Hardy	Annual	Flowering	Ordinary	3 feet	2½ feet
11. Hardy	Annual	Herbaceous	Loamy	3 feet	2 feet
12. Hardy	Annual	Herbaceous	Ordinary	3 feet	4 feet
13. Half-hardy	Annual	Foliage	Sandy loam	Pot plant	2 feet
14. Hardy	Annual	Flowering	Loamy	3 feet	2 feet
15. Hardy	Biennial	Flowering	Ordinary	2 feet	8 feet
16. Hardy	Biennial	Flowering	Ordinary	3 feet	2 feet
17. Hardy	Perennial	Flowering	Ordinary	For porches, &c.	—
18. Hardy	Perennial	Bulbous	Ordinary	1 foot	1 foot
19. Half-hardy	Perennial	Foliage	Sandy loam	Pot plant	2 feet
20. Hardy	Perennial	Flowering	Loamy	3 feet	2 feet
21. Hardy	Perennial	Flowering	Peaty loam	For arches, &c.	

REMARKS (*continued*)

12. Blooms in summer. Colour, blue and white. Easy of cultivation.

13. Very elegant foliage and does well in a room.

14. Blooms in summer. Colour, white. Very light and graceful sprays for decorative purposes.

15. Blooms in summer. Colour, various. Single and double kinds. Both useful.

16. Blooms in summer. Colour, white and purple. The silvery coloured fruits when dried are useful for winter decoration in rooms.

17. Blooms in summer. Colour, creamy white and red. Plant well known.

18. Blooms in spring. Colour, various. Plant the bulbs 4 inches deep.

19. An excellent plant for a room.

20. Blooms in summer. Colour, blue. Suitable for borders.

21. Blooms in summer. Colour, white. There is also a yellow summer-blooming and a yellow winter-blooming Jasmine.

Common name	*Botanical name*	*Natural order*	*How propagated*	*When propagated*
22. Lilium	Lilium (various)	Liliaceae	Offsets	Autumn
23. Larkspur	Delphinium formosum	Ranunculaceae	Division and seed	Spring
24. Lily-of-the-Valley	Convallaria majalis	Liliaceae	Division	Spring
25. Michaelmas Daisy	Aster (various)	Compositae	Division	Spring
26. Moneywort	Lysimachia nummularia	Primulaceae	Division	Spring
27. Pansy	Viola tricolor	Violaceae	Seed and cuttings	Summer and Autumn
28. Phlox	Phlox (various)	Polemoniaceae	Seed and division	Spring
29. Primula	Primula (various)	Primulaceae	Seed	Spring
30. Pyrethrum	Pyrethrum (various)	Compositae	Seed and division	Spring
31. Tulip	Tulipa (various)	Liliaceae	Bulbils	November to February
32. Violet	Viola odorata	Violaceae	Runners	April

REMARKS (*continued*)

22. Blooms in summer. Colour, various. Plant bulbs 6 inches deep.

23. Blooms in summer. Colour, blue. The annual Larkspur is of all colours and is easily raised from seed in spring.

24. Blooms in early summer. Colour, white. Plant 2 inches deep. New beds should be made every few years.

25. Blooms in autumn. Colour, various. An indispensable border plant for cut bloom.

26. Blooms in summer. Colour, yellow. The plant is known by the name of Creeping Jenny.

Hardiness of plant	*Duration of plant*	*Nature of plant*	*Soil required*	*Distance apart to be grown*	*Approx. height of plant*
22. Hardy	Perennial	Bulbous	Sandy loam	2 feet	3 feet
23. Hardy	Perennial	Herbaceous	Ordinary	3 feet	3 feet
24. Hardy	Perennial	Herbaceous	Sandy loam	6 inches	6 inches
25. Hardy	Perennial	Herbaceous	Ordinary	2 to 4 feet	2 to 4 feet
26. Half-hardy	Perennial	Creeper	Ordinary	Pot plant	—
27. Hardy	Perennial	Flowering	Sandy loam	1 foot	6 inches
28. Hardy	Perennial	Herbaceous	Ordinary	3 feet	3 feet
29. Half-hardy	Annual	Flowering	Peaty loam	Pot plant	1 foot
30. Hardy	Perennial	Herbaceous	Ordinary	3 feet	2 feet
31. Hardy	Perennial	Bulbous	Ordinary	1 foot	1 foot
32. Hardy	Perennial	Flowering	Leaf mould and loam	1 foot	4 inches

REMARKS (*continued*)

27. Blooms in summer. Colour, various. The cuttings taken in autumn should be put in a cold frame and protected during the winter from severe frosts.

28. Blooms in summer. Colour, various. Phlox Drummondii is a half-hardy annual.

29. Blooms in winter and spring. Colour, various.

30. Blooms in summer. Colour, various. Single and double flowers. Excellent for cut blooms.

31. Blooms in spring. Colour, various. Plant 2 or 3 inches deep.

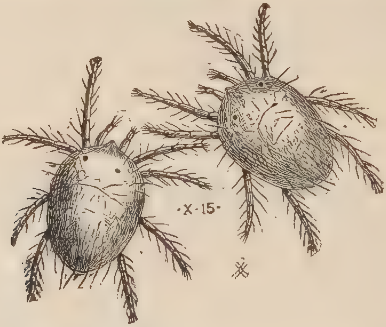
32. Blooms in spring. Useful for winter blooming when grown in pots and frames.

CHAPTER XII

INSECTS AND DISEASES WHICH ATTACK FLOWERING AND FOLIAGE PLANTS

INSECTS

THE most common and numerous are the various **Aphides**. The young shoots of the rose are attacked by a green fly called *Aphis rosae*; the soft succulent shoots of the dahlia by a black fly, *Aphis dahliae*; and the tender shoots of the sweet pea by *Aphis laythyri*. To keep these pests in check syringe frequently with soap-suds, soft-soap-and-water, quassia extract, and tobacco-water.

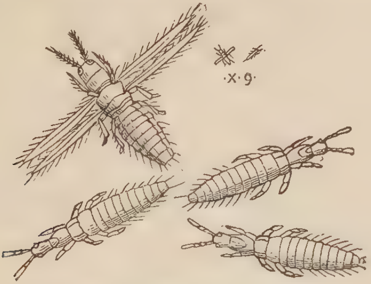


Red Spider (*Tetranychus telarius*).
[*Copyright S. & S.*

The work of the larvae of the **Leaf Miners** is often to be seen in the serpentine markings which disfigure the leaves of roses and chrysanthemums. The rose Leaf-Miner is called *Netticula anomalella*, and the chrysanthemum Leaf-Miner *Phytomyza chrysanthemi*. The egg laying may be checked by syringing with above solutions. To pinch the maggots between the finger and thumb is the most satisfactory manner of destroying this pest.

The Red Spider (*Tetranychus telarius*) is scarcely to be seen with the naked eye. It is not, as the name would imply, always red, but varies in colour from light yellow to dark red. A hot dry atmosphere is favourable to its propagation. Plenty of water at the root and overhead will prevent and destroy Red Spider.

Thrips (*Thrips minutissima*) are very minute insects which increase with great rapidity in a hot dry atmosphere. Prevention: water at the root and a humid atmosphere. Remedy: syringe with a solution made of tobacco-water ½ pint, ¼ ℔. soft-soap, and 1 gallon of water.



Thrips (*Thrips minutissima*).

[*Copyright S. & S.*

Earwigs (*Forficula auricularis*) are frequently troublesome to growers of dahlias and chrysanthemums. They should be trapped by putting dry hay, straw, or moss, into small flower-pots inverted on a stake. These traps should be examined morning and evening, as the earwigs seek dark places in which to hide during the day.

Woodlice (*Oniscus*) may be trapped by fresh cut pieces of potato hollowed out, or in the hollow stems of vegetables.

DISEASES

Mildews of one kind or another are common to many plants.

The Rose Mildew (*Sphaerotheca pannosa*) in some seasons and in some gardens is most destructive. The chrysanthemum, also, when cultivated as a pot-plant, is frequently attacked by a mildew called *Oidium chrysanthemi.*

A close muggy atmosphere favours mildew. As soon as the white mould is seen on the leaves either dust them with flowers of sulphur, using a fine muslin bag or a "sulphurator", a bellows used for the purpose, or else syringe the plants with a solution of sulphide of potassium or liver of sulphur, ½ oz. to 1 gallon of water; choosing a calm evening and using a syringe with a fine rose.

Rust. There are a great many kinds of rust known. Those attacking the rose (*Phragmidium subcorticatum*); the chrysanthemum (*Puccinia hieracii*); the hollyhock (*Puccinia malvacearum*); and the carnation or pink called *Puccinia arenariae*, are the best known.

The remedies are to syringe, either with sulphide of potassium, ½ oz. to 1 gallon of water, or with a rose-coloured solution of Condy's fluid.

To keep plants healthy, and free from insects and diseases, always give them plenty of light, air, and water.

CHAPTER XIII

FRIENDS OF THE GARDEN

It is consoling to know that many insects (beetles and flies), besides centipedes and the Testacella Slug, instead of devouring our crops really protect them by being carnivorous and living on garden pests.

The cultivator of a garden has also a friend in the Earthworm (*Lumbricus terrestris*), if not present in excess numbers, for it benefits the soil by loosening and exposing it to climatic agencies.

The Centipede (*Geophilus subterraneus*) with its many legs, one pair to each segment of the body, is useful in a garden as it lives on insects, maggots, slugs, and snails.

The Ichneumon Fly (*Microgaster glomeratus*), which is a parasitic insect, lays its eggs on larvae and chrysalids of injurious insects, as, for example, on the caterpillar of the large white Cabbage Butterfly ; and when the fly larvae hatch out they destroy the maggots and chrysalids.

The Ear-Shelled Slug (*Testacella haliotidea*) is easily recognized by its yellow colour and its ear-shaped shell, which is at the base of its tail. Every one who cultivates a garden should become acquainted with this useful slug, as it lives on worms and injurious slugs.

The Ladybird (*Coccinella septempunctata*) along with other Coccinellae are extremely useful in a garden as destroyers of *Aphides.*

The Glow-worm (*Lampyris noctiluca*) is a carnivorous beetle which feeds on small snails.

The Soldier-beetle (*Telephorus*), the Tiger-beetle (*Cicindela campestris*), and the Rove-beetle or Devil's Coach-Horse (*Ocypus olens*) are said to be useful insects in a garden.

The Hover-fly (*Syrphus*), and the Lace-winged Fly (*Hemerobius*), are spoken of as useful parasitic flies, which destroy *Aphides.*

BIRDS

It has been, and still is with many gardeners, a moot point as to whether birds should be encouraged in a garden or not.

We will not attempt to solve the problem, but will give first, a list of birds we think far more useful than injurious, and which should therefore be encouraged ; and, secondly, a list of birds we think far more injurious than useful.

USEFUL

Blue Tit (*Parus caeruleus*), subsisting chiefly on insects.

Garden Warbler (*Sylvia salicaria*), the food of which is almost solely insects.

Blackbird (*Turdus merula*), lives on beetles, worms, slugs, &c., and ripe fruits.

Blackcap (*Sylvia atricapilla*), whose food is chiefly insects.

Chiffchaff (*Phylloscopus minor*), lives on caterpillars and small insects.

Spotted Flycatcher (*Muscicapa grisola*), lives on flies, gnats, and beetles.

Robin (*Erithacus rubecula*), lives on worms, slugs, and spiders.

Wheatear (*Saxicola oenanthe*), lives on worms, snails, slugs, and insects (rarely seen in gardens).

Common Wren (*Anosthura troglodytes*), lives on small insects.

Hedge Sparrow (*Decentor modularis*), lives on slugs, insects, and worms.

Barn Owl (*Aluco* or *Strix flammeus*), lives on mice, rats, moles, and large insects.

Song Thrush (*Turdus musicus*), lives on worms, snails, &c., and a few fruits.

Common Starling (*Sturnus vulgaris*), lives on insects and a few cherries.

Linnet (*Linnota cannabina*), lives on weed seeds chiefly.

Goldfinch (*Carduelis elegans*), lives on seeds of thistles and other weeds.

Skylark (*Alauda arvensis*), lives on weed seeds and a little corn.

Lapwing (*Vanellus cristatus*), lives on snails, and larvae of insects.

INJURIOUS

Bullfinch (*Pyrrhula Europaea*), lives on buds, berries, and seeds.

House Sparrow (*Passer domesticus*), lives on corn, peas, buds, &c.

Tree Sparrow (*Passer montanus*), lives on corn, peas, &c.

Whitethroat (*Sylvia rufa*), lives on peas and ripe fruit.

The Chaffinch (*Fringilla coelebs*); the Greenfinch (*Coccothraustes chloris*), and the Hawfinch (*Coccothraustes vulgaris*), live on seeds, peas, and corn; but they also feed on weed seeds and insects, particularly when bringing up their young.

Always give the birds the benefit of a doubt. We can net our fruit, black-cotton our seedlings, and take other steps to keep the injurious ones in check.

CHAPTER XIV

WEEDS

Plants which grow in the wrong place are called weeds.

These, when growing amongst other crops, do a great deal of harm: (1) they occupy the space which the cultivated plants should have; (2) they take from the soil soluble plant foods; (3) they rob the ground of moisture; (4) they act as host plants for insects and diseases; and (5) they exclude light and air; therefore it is highly important they should be kept in check when a cultivated crop is on the ground.

There are times when annual weeds like groundsel and chickweed are allowable, so long as they do not seed, for they will take the place of a green or catch crop and can be dug in for manure. The plants not only absorb the carbonic-dioxide from the atmosphere through their leaves, but they also take up the soluble nitrogen and other plant foods in the soil by their roots.

Annual weeds can easily be destroyed by hoeing, but perennial weeds like couch and bindweed should have every bit of root forked or dug out of the ground.

The following is a list of common weeds, which every schoolboy should know something about.

Common name	*Botanical name*	*Natural order*
1. Bent Grass	Agrostis vulgaris	Gramineae
2. Bindweed, Lesser	Convolvulus arvensis	Convolvulaceae
3. Bladder Campion	Silene inflata	Caryophylleae
4. Brome, Soft	Bromus mollis	Gramineae
5. Buttercup	Ranunculus acris	Ranunculaceae
6. Celandine, Great	Chelidonium majus	Papaveraceae
7. Celandine, Lesser	Ranunculus Ficaria	Ranunculaceae
8. Charlock	Brassica sinapis	Cruciferae
9. Charlock, White	Raphanus Raphanistrum	Cruciferae
10. Chickweed	Stellaria media	Caryophyllaceae
11. Chickweed, Mouse-ear	Cerastium triviale	Caryophylleae
12. Coltsfoot	Tussilago Farfara	Compositae
13. Couch	Triticum or Agropyrum repens	Gramineae
14. Creeping Cinquefoil	Potentilla reptans	Rosaceae
15. Daisy	Bellis perennis	Compositae
16. Dandelion	Taraxacum officinale	Compositae
17. Deadly Nightshade	Atropa Belladonna	Solanaceae
18. Dead Nettle, Red	Lamium purpureum	Labiatae
19. Dead Nettle, White	Lamium album	Labiatae
20. Dock, Broad-leaved	Rumex obtusifolius	Polygonaceae
21. Dock, Curled	Rumex crispus	Polygonaceae
22. Field Scabious	Scabiosa arvensis	Dipsaceae
23. Field Thistle	Carduus arvensis	Compositae
24. Fool's Parsley	Aethusa Cynapium	Umbelliferae
25. Foxglove	Digitalis purpurea	Scrophularineae
26. Fumitory	Fumaria officinalis	Fumariaceae
27. Goosefoot	Chenopodium album	Chenopodiaceae
28. Goose-grass	Galium oparine	Rubiaceae
29. Ground-Ivy	Nepeta Glechoma	Labiatae
30. Groundsel	Senecio vulgaris	Compositae

REMARKS

2. There is a larger Bindweed, with large white flowers and long twining climbing stems, called Calystegia.

3. Height about 2 feet.

5. It also grows on chalky and clayey soils.

6. Approximate height 1 to 2 feet.

7. The root produces new tubers annually, from which young plants grow.

8. Erect growth, height approximately 1 foot.

9. A weed well known.

10. Dwarf spreading and of quick growth.

11. Dwarf and spreading.

12. Plant flowers before the leaves appear.

13. The underground stems spread rapidly.

14. The creeping stems root at nearly every joint.

How propagated	*Duration of plant*	*Kind of soil where found growing*	*Time of flowering*	*Colour of bloom*
1. Div. and seed	Perennial	Sandy	Summer	—
2. Seed	Perennial	Loamy	Summer	White and pink
3. Seed	Perennial	All kinds	Summer	White
4. Seed	Annual	All kinds	Summer	Greenish
5. Division	Perennial	Loamy	Summer and Autumn	Yellow
6. Division	Perennial	All soils	Summer	Yellow
7. Division	Perennial	Damp soils	Spring	Yellow
8. Seed	Annual	All kinds	Summer	Yellow
9. Seed	Annual and Biennial	All kinds	Summer and Autumn	White
10. Seed	Annual	All kinds	All the season	White
11. Seed	Annual	All kinds	Summer	White
12. Seed	Perennial	All kinds	Early Spring	Yellow
13. Division of underground stems	Perennial	All kinds	Summer	Greenish
14. Division	Perennial	All kinds	Summer and Autumn	Yellow
15. Division	Perennial	All kinds	All the season	White
16. Seed	Perennial	All kinds	Summer	Yellow
17. Seed	Perennial	Calcareous	Summer	Violet
18. Seed	Annual	All soils	All the season	Purple
19. Division	Perennial	All soils	All the season	White
20. Division	Perennial	All kinds	Summer	Reddish
21. Div. and seed	Perennial	All kinds	Summer	White
22. Div. and seed	Perennial	All kinds	Autumn	Violet
23. Division	Perennial	All soils	Summer	Purple
24. Seed	Annual	Calcareous and loamy	Summer and Autumn	White
25. Seed	Biennial and Perennial	Sandy	Summer	Purple
26. Seed	Annual	Loamy	Summer and Autumn	Purple
27. Div. and seed	Annual	All kinds	Summer	Green
28. Seed	Annual	All kinds	Summer and Autumn	White
29. Div. and seed	Perennial	All kinds	Spring	Blue
30. Seed	Annual	All kinds	Nearly all the year round	Yellow

REMARKS (*continued*)

15. Dwarf growing.

16. Flat growing habit.

17. Poisonous. Found in waste places.

18. A well-known weed.

19. A well-known weed.

20. Roots thick and deep.

21. Height about 2 feet.

22. Height 1 to 2 feet.

23 Stems annual, rootstock perennial and creeping.

24. Height of plant 1 to 2 feet.

25. Height 2 to 3 feet.

26. A very common weed on sandy loams.

27. Height 1 to 3 feet.

28. The plant is known as Cleavers. It will extend several feet and climb bushes.

29. A dwarf creeping or spreading plant.

30. Height 6 to 12 inches.

Common name	*Botanical name*	*Natural order*
31. Herb Robert	Geranium Robertianum	Geraniaceae
32. Horse Daisy	Matricaria inodora	Compositae
33. Horsetail	Equisetum arvense	Equisetaceae
34. Knapweed	Centaurea nigra	Compositae
35. Knotgrass	Polygonum aviculare	Polygonaceae
36. Mallow	Malva sylvestris	Malvaceae
37. Marigold, Corn	Chrysanthemum segetum	Compositae
38. Mugwort	Artemisia vulgaris	Compositae
39. Nipplewort	Lapsana communis	Compositae
40. Ox-eye Daisy	Chrysanthemum leucanthemum	Compositae
41. Plantain, Broad-leaved	Plantago major	Plantagineae
42. Plantain, Hoary	Plantago media	Plantagineae
43. Poppy, Red	Papaver Rhoeas	Papaveraceae
44. Quaking Grass	Briza media	Gramineae
45. Ragwort	Senecio Jacobaea	Compositae
46. Ribgrass	Plantago lanceolata	Plantagineae
47. Self-heal	Prunella vulgaris	Labiatae
48. Shepherd's Purse	Capsella bursa-pastoris	Cruciferae
49. Silver Weed	Potentilla anserina	Rosaceae
50. Sorrel	Rumex acetosa	Polygonaceae
51. Spear Thistle	Carduus lanceolatus	Compositae
52. Common Speedwell	Veronica officinalis	Scrophularineae
53. Speedwell, Corn	Veronica agrestis	Scrophularineae
54. Speedwell, Germander	Veronica chamaedrys	Scrophularineae
55. Stinging Nettle	Urtica dioica	Urticaceae
56. Stinking Mayweed	Anthemis Cotula	Compositae
57. Succory or Chicory	Cichorium Intybus	Compositae
58. Sun Spurge	Euphorbia helioscopia	Euphorbiaceae
59. Tansy	Tanacetum vulgare	Compositae
60. Thorn Apple	Datura Stramonium	Solanaceae
61. Yarrow	Achillea millefolium	Compositae

REMARKS (*continued*)

31. Height about 1 foot.

32. Branching and spreading stems.

33. A well-known weed.

34. Height from 1 to 2 feet.

35. Branched and prostrate weed, known by some as Knotweed.

36. Height 1 to 3 feet.

37. Height about 1 foot.

38. Height 2 to 3 feet.

39. Growth upright 1 to 2 feet.

40. Not common on sandy soils.

41. Growth compact and close to the ground.

42. A partiality for chalky soils.

43. Upright growth. Height 1 to 2 feet.

45. Height 2 to 4 feet.

46. A well-known weed.

47. Dwarf growing.

48. Leaves spread on the ground. Flower spike erect.

How propagated	*Duration of plant*	*Kind of soil where found growing*	*Time of flowering*	*Colour of bloom*
31. Seed	Annual	Nearly all soils.	All the season	Reddish-purple
32. Seed	Annual and Biennial	All soils	All the season	Yellow disc, white florets
33. Division of root	Perennial	Damp	Spring	—
34. Division	Perennial	All kinds	Summer	Purple
35. Seed	Annual	All soils	All the season	Various
36. Seed	Biennial	Damp loams	Summer	Purple
37. Div. and seed	Annual	Loamy	Summer	Yellow
38. Div. and seed	Perennial	Sandy	Autumn	Yellow
39. Div. and seed	Annual	Loamy	Summer	Yellow
40. Division	Perennial	Nearly all soils	Summer	Yellow disc, white ray florets
41. Seed	Perennial	All kinds	Summer and Autumn	Greenish-brown
42. Seed	Perennial	Limestone	Early Summer	Pink
43. Seed	Annual	Most kinds	Summer	Scarlet
44. Seed	Perennial	All kinds	Summer	Greenish
45. Seed	Perennial	Loamy	Summer	Yellow
46. Seed	Perennial	All kinds	All the season	Greenish-brown
47. Div. and seed	Perennial	All kinds	Summer and Autumn	Purple
48. Seed	Annual	All kinds	All the season	White
49. Division	Perennial	All kinds	Summer	Yellow
50. Div. and seed	Perennial	All kinds	Summer	White
51. Seed	Biennial	Most soils	All summer	Purple
52. Division	Perennial	All soils	All summer	Blue
53. Seed	Annual	All soils	All the season	Blue
54. Division	Perennial	All soils	Spring and Summer	Blue
55. Division	Perennial	All soils	Summer and Autumn	Greenish
56. Div. and seed	Annual	Loamy	Summer	Ray florets white
57. Division	Perennial	Stonebrash	Summer and Autumn	Blue
58. Div. and seed	Annual	Loamy	All the season	Greenish
59. Div. and seed	Perennial	All kinds	Late Summer	Yellow
60. Seed	Annual	Sandy	Summer and Autumn	White
61. Seed	Perennial	All kinds	All the season	White and pink

REMARKS (*continued*)

49. Leaves silvery white underneath.

50. Height 1 to 2 feet.

51. Height about 3 feet. Not abundant on chalky soils.

52. Known almost everywhere.

53. Has creeping or prostrate stems.

54. Found in pastures and gardens. Dwarf and spreading growth.

55. Approximate height of flowering stems 3 feet.

56. Height about 1 foot.

57. In some parts very common.

58. Height about 6 inches.

59. Height about 3 feet.

60. Frequently seen in the south of England and the Midlands.

61. Creeping underground stems. Height of plant about 1 foot.

CHAPTER XV

CALENDAR OF GARDENING OPERATIONS

JANUARY

Vegetable Garden.—Manure, dig, and trench vacant ground. Heavy soils will be benefited by a dressing of basic slag, 4 ℔. to 1 pole of ground; or lime 14 ℔. to 1 pole of ground.

Leave the ground as rough or lumpy as possible when digging; then spread the basic slag or lime on the top.

Light soil will be benefited by a dressing of kainit, 3 ℔. to 1 pole of ground, used as above.

Potatoes that have been pitted and are required for seed should now be placed in shallow boxes and exposed to light to encourage short stocky growth of the crown eyes. An empty bedroom or any frost-proof place will do to place them in.

A pinch of onion seed may be sown towards the end of the month in boxes in a warm frame or greenhouse or in the schoolroom. When the seedlings are large enough to handle prick out into other boxes, give the plants plenty of light and air, and transplant into the open about the middle of April into well-manured ground; plant in rows 15 inches apart and the plants 8 inches apart in the rows.

Fruit.—The pruning and training of wall trees may be done as the weather allows.

Select grafts or scions of apples and pears required for grafting and lay in the soil till wanted. The shoots should be 12 to 15 inches long and well ripened.

If birds attack the buds of gooseberries, give the trees a dressing of soot or lime and wind black cotton round the shoots.

Fruit trees covered with moss or lichen may be limewashed or syringed with alkali wash; for particulars see February operations.

Flowers.—Alterations in the flower garden may be done as the weather allows.

Carefully fork over beds and borders filled with plants and mulch with decayed manure, if not already done.

FEBRUARY

Vegetables.—Complete as far as possible the trenching and digging of the ground. Towards the end of the month make a sowing of broad beans. Plant in either single or double rows, in strong retentive soil; if the former, plant in rows 2 feet apart, putting the beans 4½ inches apart in the row and 2 inches deep; if grown in double rows, the rows should be 3 feet apart and the beans 9 inches apart in the row, planted alternately in lines 6 inches apart. Hoe frequently between the rows, and if the plants are growing in an exposed position, earth them up when young to afford protection from the cold and cutting winds. When there are a nice lot of pods formed, pinch out the tops of the plants, this will hasten development and maturity of the pods and check an attack of black fly or aphis. In hot, dry weather mulch the ground with half-rotten manure and syringe the plants with soap-suds.

"Broad Green Windsor" and "Bunyard's Exhibition Long Pod" are good varieties to grow besides those previously named.

Plant root-cuttings of about 8 inches in length of Horse-radish, in well-manured and deeply trenched soil. Make holes about 15 inches apart each way and 15 inches deep with a crowbar and drop in the cuttings.

Where heat is at command small sowings of Brussels sprouts, cabbage, leeks, lettuces, and onions may be made.

Fruit.—Planting of trees may still be done in suitable weather. Pruning may be done during this and the next month. A good fruit-tree manure to apply in winter is equal parts of kainit and basic slag, pointing or digging into the surface soil 4 oz. to the square yard, then mulch with half-rotten stable manure.

For cankered fruit trees Tonk's formula may be recommended—superphosphate of lime 12 parts, nitrate of potash 10 parts, chloride of soda 4 parts, sulphate of magnesia 2 parts, sulphate of iron 1 part, and sulphate of lime 8 parts. Either spread on or forked into the surface soil at the rate of ¼ ℔. to the square yard. Any chemist will make up the mixture. Trees covered with lichen or moss should either be lime-washed or syringed with caustic alkali wash made of 1 ℔. of caustic soda, 1 ℔. of carbonate of potash, ¼ ℔. of soft soap, and 10 gallons of water. Mix carefully, and apply with a syringe or knapsack sprayer.

The manure should, however, if possible, be applied in November. The trees should be syringed twice a year, November and February, with the alkali wash if they are very bad.

Flowers.—Towards the end of the month, if the weather is favourable, hardy annuals may be sown. Rose-trees may be planted this month. Avoid deep planting. Spread out the roots carefully and cover with fine soil, tread in the soil firmly and mulch round the plants after planting with manure as a protection from frost.

Sow in a heated greenhouse or on a hotbed towards the end of the month seeds of begonias, chrysanthemums, dahlias, and Marguerite carnations. Do not allow the seedlings to get drawn by sowing too thickly or giving the plants too much heat.

March

Vegetables.—A sowing of celery, "White Gem," for an early crop should be made under glass. Sowings of Brussels sprouts, "Dwarf Gem;" cauliflower, "Early Dwarf Erfurt;" cabbage, "Earliest of All;" leek, "Prizetaker;" and lettuce, "All the Year Round," can be made in the open.

Sow parsnips, "Tender and True," "Hollow Crown," or "The Student".

Sow radishes thinly on a rich warm soil and cover the seed about 1 inch deep.

The onion bed prepared in the early winter should now be raked down and a firm fine even surface obtained. Sow the seed thinly and after filling in the drills, firm down the bed and rake over the surface lightly to take out the footmarks. One ounce of seed will sow a drill 300 feet long.

Plant shallots in rows 1 foot apart, pressing in the bulbs to half their depth at 9 inches apart in the rows.

Make a successional sowing of broad beans; for particulars of cultivation see February operations.

Make two or three sowings of peas at intervals of ten to fourteen days. Level down the ground which has been winter trenched or deeply dug; put down a line and dig a trench 6 inches deep; then mix with the soil at the bottom of the trench, lime rubble and plenty of decayed manure, place 3 inches of soil on to this; then sow the peas thinly and cover 2 to 3 inches deep. Half a pint of seed will sow a row 50 feet long. To protect the peas against mice, cover them with red lead; and to keep off the birds, put black cotton along the rows. The following are good varieties to grow and are given in the order in which they should be sown. "Early Giant," height 3 feet; "Gradus," height 3 feet; "Thomas Laxton," height 3 feet; "The Gladstone," height $3\frac{1}{2}$ feet; "Autocrat," height 4 feet; and "Ne Plus Ultra", height 5 feet.

To grow Jerusalem artichokes successfully plant good-sized sets in a sandy loam, $1\frac{1}{2}$ feet apart in the row and 4 inches deep. When the shoots are 4 feet high pinch out the tops. The rows should be 4 or 5 feet apart. "Sutton White" is a good variety to grow.

Divide rhubarb roots and plant them 3 or 4 feet apart each way in deeply trenched and well-manured ground.

Sow tomatoes in heat for planting out of doors early in June. "Earliest of All," "A 1," and "Best of All", are good varieties to grow.

Fruit.—Complete the pruning of hardy and bush fruits. Remember to cut out all dead wood. Try and leave the buds and fruiting shoots so that they will get plenty of air and sunshine. Inside and crossing shoots are best cut out. Thin out crowded spurs on horizontal and fan-trained trees. Keep the centre of bush trees well thinned out. Pears should not be pruned so severely as apples. Cut out and burn all cankered and American blighted shoots and branches. Where large branches have to be sawn off, trim up and bevel the cuts with a good sharp knife, covering them with a little Stockholm tar. Note also that the branches should be taken off fairly close up to the main branches, and not "snagged". Cut leading shoots to outside wood buds, the slope of the cut should be at an angle of 45° and just above the bud. Grafting should be done towards the end of the month and early in April. See that the stocks are healthy, well rooted, and showing signs of growth, and that the growth of the scions has been kept back. Make clean cuts and do the operation quickly, covering the union with clay or grafting wax. Pears grafted on to quince stocks should be done close to the ground.

Flowers.—The pruning of roses other than Teas and Noisettes should be done towards the end of the month. In Hybrid Perpetuals cut away all twiggy and unripened growth, shortening back the strong shoots to four or six eyes from the base. Climbing roses should also, if newly planted, be cut back to 1 foot to encourage young growth from the base. But climbers well established will only require the thin and useless wood cut out and the leaders shortened to the well-ripened wood. Make clean cuts and cut to eyes or buds pointing away from the centre of the plant.

Hardy annuals may be sown this month. Sow thinly in rich and well-prepared ground and give the plants ample space by thinning well. Nasturtiums do well in poor soil. Defer sowing till next month if the ground is wet and pasty.

Gypsophila, larkspur, lupinus, mignonette, and poppy do not transplant well, therefore they should remain where sown.

The following are useful annuals to sow:—Coreopsis, cornflower, godetia, sweet pea, and sweet sultan.

Half-hardy flowers like asters, stocks, marigolds, and zinnias should be sown in a cool greenhouse.

The repotting of window and greenhouse plants should be done as they show signs of growth. Palms should not be overpotted.

APRIL

Vegetables.—Sow the "Globe" or turnip-rooted beet for an early crop. Put lines of black cotton along the rows to keep off the birds. Successional crops of broad beans, peas, radishes, and lettuces should be sown. Sowings of broccoli, kale, and savoys should be made.

Carrots—" Early Gem " and " Favourite " should be sown. To ensure thin sowing mix the seed with finely-sifted dry soil or sand. Half an ounce of seed will sow a row 100 feet long. Thin the plants first to 3 inches apart and then to 6 inches apart.

Keep the hoe going to keep down the weeds and promote quick growth; after each thinning a dressing of nitrate of soda at the rate of ½ oz. to each yard run, and put between the rows in showery weather, will be very helpful to the young plants.

A sowing of celery, " A 1 " (red), can be made outside on a warm border. The seedlings from the sowing made under glass, should, when large enough to handle, be pricked out into a frame in which good rotten dung, leaf mould, and loam have been well mixed together and placed to a depth of several inches. Prick out the plants 6 inches apart, water, put on the lights and then shade for a few days. Encourage stocky growth by giving air on all favourable occasions.

Potatoes should be planted as time and weather will allow.

" Early Snowball " turnip should be sown in well-manured ground. Sow the seed thinly and thin the plants, when large enough to handle, to 6 inches apart.

Fruit.—After the pruning of the trees, point over the soil and bury the manure used for winter mulching. Do not dig so deeply about fruit trees as to destroy their roots.

It may appear ridiculous, after much rain, to advise the inspection of fruit-tree borders against walls, to see that they are sufficiently moist to meet the demands of the budding trees.

But it is so important a matter that it cannot be overlooked. Attend to the disbudding or rubbing out of the shoots on apricots and other trees as they appear, if badly placed or not required. Secure and encourage the growth of those shoots which improve the shape of the tree and which will become fruiting wood.

Where there is an abundance of fruit set on a tree take off those not keeping pace with the most forward fruits, as they will never do any good.

Keep watch against the depredations of insect pests, and on their first appearance resort to syringing the trees with soap-washes, &c.

Flowers.—Make a successional sowing of hardy annuals. A sowing of half-hardy annuals may also be made this month outside on a south border.

Prune Tea and Noisette roses. Clip ivy. Plant out pansies and carnations. Complete the planting and renovation of the herbaceous border. Propagate violets by planting the runners in a good rich soil. Sow primulas and cinerarias for early flowering.

List of Window Plants. — Foliage — Ferns, Palms, Anthericum Variegatum, Aralia Sieboldii, Aspidistras, Araucaria Excelsa, Cacti, Aloes, Agaves, Rex Begonias, Carex Japonica Variegata, Coleus, Cyperus Alternifolius, Dracaenas, Ficus Elastica (Indiarubber plant), and Grevillea Robusta.

Flowering—Tuberous and fibrous-rooted Begonias, Callas, Petunias, Cytisus Racemosus, Francoa Ramosa, Fuchsias, Zonal, Ivy-leaved and Show Pelargoniums, Primula Obconica, Saxifraga Sarmentosa, Musk, Moneywort, Hydrangea, Crassula Coccinea, Cyclamen, Yellow and White Marguerite.

MAY

Vegetables.—Sow "Blood-red" and "Pine Apple" beet for the main crop.

Successional sowings of peas, radishes, and lettuces, should be made.

Plant runner beans, "Best of All" or "A 1", near to the sticks fixed for them to climb.

Sow dwarf beans, "Canadian Wonder."

Prepare celery trenches.

Plant out into drills, in showery weather, cabbages and cauliflowers.

Plant out lettuces when large enough to handle.

Sowings of savoys, "Earliest" or "Perfection"; kale, "A 1;" and broccoli, "Late Queen," or "Latest of All", should be made.

Gradually harden off tomatoes for planting out early in June. Thin onions, carrots, parsnips, and beet, as required. Keep the hoe going amongst crops to keep down weeds and promote growth. To protect seedlings from birds, dust with soot.

Herbs.—Sow dill, fennel, pot marigold, sweet marjoram, rosemary, and rue.

Propagate horehound, mint, sage, pot marjoram, and thyme, by cuttings.

Fruit.—Remove all superfluous shoots and fruits. Keep the foliage clean and encourage growth by frequent syringings. Ground not mulched should be frequently hoed.

Cover strawberry beds with clean straw or long litter from stable manure. Put it round the plants carefully.

Flowers.—Mulch newly-planted shrubs.

Sow wallflowers and sweet williams out of doors, Chinese primulas and cinerarias under glass, for winter and spring blooming. Keep the rose-trees free from aphis by syringing with soap-washes, &c. Examine leaves curled up and destroy all maggots found in them. Hand picking these pests is undoubtedly the best way to keep them under.

Window Plants.—Water and feed as required. In showery weather put the foliage plants outside for an hour or two; rain will do them good. To prolong the blooming period shade the plants from the sun.

JUNE

Vegetables.—Make successional sowings of spinach, lettuce, dwarf beans, runner beans, and peas. "Early Giant" and "Gradus" are good varieties of peas to sow now.

Plant out in showery weather celery, cauliflower, broccoli, Brussels sprouts, &c.

Keep the ground free from weeds and promote root action by frequently hoeing where the ground is not mulched between the rows.

If June is hot and dry, mulchings of short manure between the rows, and syringings overhead occasionally, will benefit most crops. Free healthy growth must be encouraged.

Fruit.—Propagate strawberries by layering runners from fruitful plants.

Trees carrying heavy crops of fruit should be kept healthy and well fed.

Protect fruits from birds by means of nets.

Flowers.—Sow in the open, seeds of anemone, aquilegia, hollyhocks, Brompton stocks, pansy, polyanthus, and wallflowers.

Sowings of cineraria, primula, and calceolaria can be made under glass.

Chrysanthemums.—The following is a useful compost for potting up chrysanthemums into their flowering pots, viz. 3 parts turfy loam, 2 parts leaf mould, ½ part charcoal, ½ part wood ashes, ¼ part brick and lime rubble, ¼ part bone meal and dissolved bones mixed, ¼ to ½ part of sand, and to every 2 bushels of the mixture add a 6-inch pot full of soot.

JULY

Vegetables.—Make successional sowings of dwarf beans, turnips, radishes, and lettuces.

Plant out celery, leeks, and winter greens, without delay. Fill up the ground after early potatoes and peas with crops of a different kind, not having the same habit of growth or requiring the same methods of cultivation.

Tomatoes outside should be liberally fed and mulched with horse droppings. Keep the side shoots pinched out.

Vegetable marrows should have strong vigorous shoots stopped. Fertilization or setting of the blooms is necessary if marrows are to be saved for seed production.

Attention should be given to the healthiness of crops, burning diseased plants, and taking prompt measures to check the ravages of insects and diseases.

Keep down weeds. Water and feed crops liberally.

A sowing of parsley should be made for winter use.

Fruit.—It behoves those who have crops of fruit of various kinds to take every care of them.

Keep the foliage healthy by frequent syringings, admit light and air by taking out dead and superfluous shoots, concentrate the energies of the plant on the swelling of the fruit by pinching or stopping the laterals and growth not required for extension about six leaves above the old wood.

To supplement the above, feed the trees liberally with liquid manures and mulch the ground to prevent the rapid evaporation of moisture and the cracking of the soil.

Flowers.—Propagate carnations by layering, and pinks by pipings and cuttings. Put the pipings and cuttings 3 or 4 inches apart into a frame, in which a sandy soil a few inches deep has been placed and made firm.

Water and then close the lights and keep the plants shaded for a few days.

Sweet peas should have the blooms cut daily. The formation of seed-pods is very detrimental and checks the flowering. Feed the plants with liquid manure.

Bush roses making gross shoots and not showing bloom may have their growing points pinched out. Cut out useless wood; remove suckers and decayed blooms. Water and feed the plants and mulch with manure. Budding may be done when the bark lifts freely. Select strong healthy shoots of an upright habit of growth.

August

Vegetables.—Make two sowings of cabbage at an interval of a fortnight. Either "Flower of Spring" or "April Variety" will do. Sow Brussels sprouts for an early supply of buttons next autumn. Earth up celery when the growth is well advanced. Be careful soil does not get into the hearts of the plants.

Sow "Winter White" cos lettuce and "Brown Spanish" onion. Sow turnips; "Snowball" for a white, and "All the Year Round" for a yellow flesh.

All kinds of herbs should now be cut and dried.

If the weather is hot and dry, late peas should be well watered and mulched to ward off mildew.

Fruit.—When raspberries have done fruiting, cut out the old canes at once and loosely tie up the new canes which are for next year's fruiting. Clear off all weeds.

Trim up strawberry plants that have done fruiting and are to be kept for another season by cutting off the runners, weeding the beds, and pointing over the soil between the rows and plants not too deeply.

Summer pruning should be done.

Keep trees healthy by frequent syringings in the evenings. Weak solutions of insecticides may be used.

Wall and other trees should not be allowed to suffer for want of water. Copious supplies should be given in a dry time to growing crops.

Flowers.—Finish the budding of roses and the layering of carnations.

Divide pinks, primroses, and polyanthuses, and plant 6 to 8 inches apart. Keep the soil moist till the plants are rooted.

Hardy annuals should be sown for blooming early in the spring.

Keep the flower garden neat and tidy by picking off dead leaves, dead flowers, and seed-pods.

September

Vegetables.—Earth up celery and leeks, selecting a dry time for the work. Plant out cabbages sown in July and August on ground where potatoes have been dug.

As crops come off, either rough dig or plant the ground with winter and spring crops.

Where there is a glut of tomatoes bottle the surplus fruits.

Fruit.—Attend to the gathering of apples, pears, and plums, as they ripen. Well stake trees against strong winds.

Root pruning of trees making superfluous growth may be done towards the end of the month.

Flowers.—Put in geranium, shrubby calceolaria, pansy, and other cuttings.

Pot cinerarias, primulas, and herbaceous calceolarias. The best of the tuberous begonias in the open ground may be lifted and potted up to finish their blooming in a greenhouse.

Catalogues of bulbs are now to be had, and those who like a good selection should order at once.

For indoor use pot up at intervals of two or three weeks batches of crocuses, hyacinths, narcissus, and tulips.

October

Vegetables.—Lift and store potatoes, carrots, beet, &c. Lift carefully, do not fork or bruise the tubers and roots. Select and grade before storing. Almost any dry frost-proof place will do for storing the roots in if they are to be used before Christmas. But if they are not to be used till after Christmas it is much better to pit them. For this, select a dry piece of ground and place the roots in layers and build to a point. Then cover with straw 8 to 10 inches thick; on the straw put several inches of soil, which should be well beaten down to get a firm and smooth surface. The pit can be ventilated by a wisp of straw or a drain pipe, the top of which should be covered to keep out the wet.

As ground becomes vacant, ridge or trench it as deep as possible, leaving it rough for the winter.

Celery and leeks when dry, and the weather is favourable, may be earthed up if not already done.

Cabbages may still be planted.

When the ground is cleared of onions, hoe and rake off the weeds, put down a line (18 inches from row to row) and with a dibber make holes 12 inches apart and 4 inches deep; then plant or drop a leek into each hole. These will be useful next April and May.

Fruit.—Apples and pears may be gathered for storing if they separate easily from the trees when lifted into a horizontal position.

Now is the time to lift and root prune trees that have made long vigorous shoots, but have borne no fruit.

Prepare the ground ready for planting new trees next month.

Select and order the fruit trees and bushes required.

Flowers.—Complete taking cuttings of bedding plants.

Lift and box, or put into pots, geraniums which are to be kept for stock.

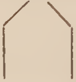
Tuberous begonias should be lifted and put into boxes so that the stems may die down and the tubers dry off a little before storing them away for the winter.

Plant narcissi, hyacinths, tulips, crocuses, snowdrops, wallflowers, forget-me-nots, primroses, &c., for spring blooming as the beds and borders become vacant.

Lift and replant box edging. Plant rose briers and prepare the ground for planting rose-trees next month.

Herbaceous borders may be rearranged and renovated.

NOVEMBER

Vegetables.—When the weather is favourable and the plants are dry, earth up celery which has finished growing. Draw the leaf-stalks well together, and press the soil firmly round. Leave the sides thus  to drain off the rain. Lift and store roots not already done. See that onions are well ripened and thoroughly dry before being put away.

Asparagus beds should be cleaned without delay, cut down the dead stems, remove weeds, lightly point or prick over the surface, being careful not to injure the crowns, and give a good dressing of rotten manure, which should have a thin covering of soil.

Earth up leeks. Trench and prepare the ground to receive all the benefits possible by a winter's exposure.

As the broccoli turn in, head the plants to the north, covering the flower with a few leaves to protect from rain, light, and frost.

Fruit.—Plant fruit trees of all kinds as the weather will allow. Buy healthy young trees with plenty of fibrous roots.

In preparing the ground, dig out the soil, not too deep, but sufficiently wide to allow of the roots, after shortening back the long strong ones, to be spread out their full length.

Raspberry beds should be cleaned and mulched, after tying in and shortening back the tops of those canes left for fruiting next year.

Flowers.—If not already done, clear away the summer bedding plants and fill the borders and beds with bulbs, wallflowers, &c.

As soon as dahlias are cut down by the frost, lift the tubers, and after drying, store them away in a dry and frost-proof place.

Plant roses of all kinds in well-manured and deeply worked soil. Prune back long strong roots and cut away bruised parts, making smooth cuts, which should lie flat on a firm soil. Do not plant too deeply, but plant firmly.

Only water greenhouse and window plants when they absolutely require it. Give air freely when the weather is favourable.

DECEMBER

Vegetables.—Trench and dig the ground as it becomes vacant, leaving it rough for the winter frosts to break down. Place pots over rhubarb and sea-kale roots if you want these things early, and cover with strawy manure made firm to impart warmth.

Parsnips can be lifted and stored in dry sand, or they can be pitted.

Cover parsley with hand lights for winter use.

Look carefully over stored potatoes and pick out any that are showing signs of decay.

Fruit.—Push on with the planting of hardy and bush fruits when the weather is favourable. Point over and mulch fruit trees of all kinds.

Attend to the staking of standard and half-standard trees where the stakes are broken. The pruning of old trees on walls and in the open can be done now. Leave the pruning of young trees till March.

Flowers.—Planting of trees, shrubs, roses, wallflowers, bulbs, &c., should be completed as soon as possible.

Look over geraniums and other bedding plants.

Stake standard and half-standard rose-trees against strong winds.

Water carefully greenhouse and window plants.

Give air on all favourable occasions; avoiding cold draughts.

CHAPTER XVI

NATURE CALENDAR

JANUARY

Plants in bloom. Daisy, groundsel, white dead-nettle, winter aconite, snowdrop, shepherd's purse, and others.

Birds. The songs of missel-thrush, wren, redbreast, and others begin.

Insects. Bees may be seen out. Chrysalids may be found.

FEBRUARY

Plants in bloom. Butcher's broom, crocus, hazel, coltsfoot, and others. The leaves of elder and honeysuckle begin to open.

Birds. Thrushes and blackbirds pair and begin to build.

Insects. House-flies appear.

MARCH

Plants in bloom. Primroses, violets, apricot, daffodil, elm, dandelion, wallflower, and others. The currants, peach, and apricot unfold their leaves.

Birds. Rooks, skylarks, and other birds lay eggs.

Insects. The ladybird appears. Many insects on the wing.

APRIL

Plants in bloom. Buttercup, cowslip, anemone, plum, pear, snake's head, strawberry, tulip, poplar, plantain, and others. The leaves of horse-chestnut, cherry, elm, laburnum, and other trees are opening.

Birds. Swallows, cuckoos, nightingales, and other birds arrive. House-sparrow, chaffinch, robin, thrushes, linnet, and wren are nest building.

Insects. Hawk-moths, turnip-fly, slugs, snails, and beetles appear.

MAY

Plants in bloom. Apple, bluebell, lily of the valley, walnut, sycamore, lilac, medlar, and others. Most forest trees are now in full leaf.

Birds. Martins, yellow wagtail, warblers, and others appear. Pheasants, partridges, goldfinches, and other birds are egg laying.

Insects. Moths, butterflies, cockchafer, and dragon-fly appear. Bees swarm.

JUNE

Plants in bloom. Grasses, dog rose, poppy, lime, honeysuckle, mulberry, foxglove, and others. Strawberries ripen.

Birds. Most birds are hatching eggs. Cuckoo heard for last time. Nightingale, redbreast, and some other birds give up singing.

Insects. The wasp, asparagus beetle, and rose beetle appear. Frog tadpoles nearly full grown.

JULY

Plants in bloom. Barley, valerian, ragwort, hemlock, clover, teasel, carrot, and others. Bush fruits ripen.

Birds. The chaffinch, blackbird, tit-lark, hedge-sparrow, song-thrush, and others cease to sing. Poultry moult.

Insects. Admiral, fritillary, and other butterflies may be seen. Many moths appear, including, amongst others, goat, garden tiger, scarlet tiger, magpie, lackey, and swallow-tail.

AUGUST

Plants in bloom. Wormwood, mugwort, thistles, soapwort, tansy, and others. Mushrooms and toadstools may be seen. Yew, honeysuckle, and other berries are ripe.

Birds. The song of the redbreast is heard. The common linnet, goldfinch, greenfinch, yellowhammer, and others, cease to sing. Swifts, nightingales, and cuckoos depart.

Insects. The different stages of the vapourer moth (*orgyia*) may be found. The hornet-fly appears.

SEPTEMBER

Plants in bloom. Ivy, laurustinus, meadow saffron (colchicum), and others. Elder, hawthorn, berberry, and other berries are ripe. Leaves of lime and chestnuts turn yellow; ash leaves begin to fall.

Birds. Chaffinch, wren, and others begin to sing again. Rooks seek winter quarters.

Insects. House-flies swarm in windows. The red under wing moth and the clouded yellow butterfly may be seen. Eggs and caterpillars of cabbage butterflies may be found.

OCTOBER

Plants in bloom. Snapdragon, white and red deadnettle, dandelion, &c. Most forest trees lose their leaves. Crab apples and sloes ripen.

Birds. Blackcap, martin, and swallow migrate.

Insects. Ladybird hibernates. Pupae or chrysalids of moths and butterflies numerous. Frogs hibernate.

NOVEMBER

Plants. Fruits of holly, rose, hawthorn, and others ripen.

Birds. The thrushes and marsh titmouse resume their song.

Insects. Pupae of all kinds may be found.

DECEMBER

Plants in bloom. Furze, Christmas rose, &c.

Birds. Skylarks, greenfinches, and chaffinches collect in flocks.

Insects. Pupae may be found.

APPENDICES

I

THE SCHOOL GARDEN AND DISCOVERY LESSONS

BY P. E. MEADON

To most of us a child's nature seems very puzzling and complex. How often we hear parents and teachers lament that their children are restless, inquisitive, destructive and mischievous—often poking where they are not wanted! Those, however, who have had experience in the training of a child's character do not usually treat these qualities as faults to be checked or eradicated, but recognize that they are signs of vigorous activity, of energy, of eager desire for knowledge, of keen anxiety to know how a thing is made and what it is made of. The observant, sympathetic, and enthusiastic teacher does not endeavour to stifle and crush out these natural tendencies of his pupils, but seeks to direct them into the right channels; to give free scope to the curiosity in right directions, and to guide the craving for knowledge, which prompts destructiveness, until it becomes changed into the power of ready invention. He recognizes that the development of the mind from within is far more important than the instruction of the mind from without, and that, as it is the child's own activity which will strengthen and develop his mind, so the condition of the learner should not be one of passive reception, as it too often is in our schools to-day, but of untiring self-exertion—activity. He does less lecturing and admits more discovery by the pupil, taking care that each child has plenty to do, with a purpose clear in his mind for each exercise—each investigation. The child's curiosity is encouraged; he becomes keener upon finding out the how and the why, and will bring specimens and questions to his teacher as long as he feels that he is welcomed and not regarded as a nuisance—a pesterer. From haphazard, unpremeditated discovery, the pupil is led to apply processes of discovery on his own initiative—to delight in unravelling the processes of outer nature.

A striking example of a young boy applying such a process of discovery on his own account is recorded in *Practical Education*, by Maria and R. L. Edgeworth (Vol. i, 1801 edition, page 84). As this book is apparently seldom read in these days, and is somewhat difficult of access, the passage is given in full:

"S———, a little boy of nine years old, was amusing himself with looking at what he called a rainbow upon the floor; he begged his sister to look at it; then he said he wondered what could make it, how it came there. The sun shone bright through the window; the boy moved several things in the room, so as to place them sometimes between the light and the colours which he saw upon the floor, and sometimes in a corner of the room where the sun did not shine. As he moved the things he said, 'This is not it;' 'Nor this;' 'This hasn't anything to do with it.' At last he found that when he moved a tumbler of water out of the place where it stood his rainbow vanished. Some violets were in the tumbler; S——— thought they might be the cause of the colours which he saw upon the floor, or, as he expressed it, 'Perhaps these may be the thing.' He took the violets out of the water; the colours remained upon the floor. He then thought that 'it might be the water'. He emptied the glass; the colours remained, but they were fainter. S——— immediately observed that it was the water and glass together that made the rainbow. ‘But,’ said he, ‘there is no glass in the sky, yet there is a rainbow, so that I think the water alone would do, if we could but hold it together without the glass. Oh! I know how I can manage.’ He poured the water slowly out of the tumbler into a basin, which he placed where the sun shone, and he saw the colours on the floor twinkling behind the water as it fell. This delighted him much, but he asked why it would not do when the sun did not shine. The sun went behind a cloud whilst he was trying his experiments: ‘There was light,’ said he, ‘though there was no sunshine.’ ”

The incident is recorded by the Edgeworths to point out that though a child may be apparently at “play” and not engaged upon a set task, yet he may not be wasting time, for “his attention was fixed, he was reasoning, he was trying experiments”. But it is safe to assert that most teachers would be proud if they could affirm that they were able to train pupils competent and eager to carry out an inquiry in this manner; and undoubtedly he is the true teacher who constantly strives to influence his pupils so that they may be anxious and able upon their own initiative to make such an investigation as the one quoted.

To every such teacher there comes the question—“How can I put the child in the path of inquiry? I know that curiosity is one of the chief springs to intelligence, but it is fitful and brief, and is influenced by temperament and environment. How can I develop this curiosity in lawful directions, distinguish between the real and the spurious, and implant a love of knowledge for its own sake?”

It is not given to all teachers to exert such an influence, but teachers who possess a school garden have a splendid opportunity not afforded to others. How can the school garden be utilized by the teacher to enable his pupils, who use it, to gain the habit of observation, the power of steady application, of self-reliance, and the desire for painstaking investigation on their own account?

In many schools, to this day, teachers depend upon their object lessons in the lower standards and upon lessons on common phenomena in the upper classes as the lessons which they consider develop, more than any others, the pupils' powers of observation and reasoning. Yet how often are these lessons not what they should be! One object is procured to show to the whole class—and that specimen is often a stuffed one, or maybe a dried plant, or an article displayed in a cabinet too diminutive and unattractive to interest the children or be of much practical use in illustrating and leading up to the points of the lesson. The object may not be passed round to each child for personal investigation, because of the resulting waste of time and probable disorder. Or, if it is passed round the class, the teacher proceeds to discuss other points in the meantime—with consequent confusion and loss. The practice of allowing one pupil to report for the remainder is also of little value, for it means probably one shy investigator, working under conditions hardly normal, to about two dozen or more passive listeners.

Such lessons, especially when taken by young teachers in the course of their training—as is frequently the case in small schools—are apt to degenerate into lists of properties and new terms, and at times even into spelling and etymology! The teacher is seldom questioned by the class under such circumstances, and they remain passive, reluctant listeners to his explanations, quite content to repeat them afterwards at his request! Lessons so managed can have but little value, for they try to instruct rather than to develop, tend to crush initiative, and so fail either to interest the children or to stimulate them to further efforts. A frequent mistake is made in treating the plants and animals under consideration as objects apart from their normal surroundings, instead of living things influenced greatly by, and adapted to, their environment.

With a school garden close at hand, at the disposal of all the classes throughout the year, how many of these lessons may be taken with advantage, in the form of discovery lessons, in the garden itself! Instead of the children sitting in desks, at some distance from the teacher's specimen or picture, they can closely examine the living plant or insect in its normal surroundings, draw their own conclusions, and report in their own simple language. Such a lesson often naturally develops into a course of lessons framed and based upon the questions that the personal investigation has prompted the pupils to ask.

Many teachers, however, have adopted with success another method for these lessons. They ask the children to observe carefully some one object, or series of related objects, for a certain period, e. g. a week. Free access is given daily to the garden and the children are encouraged to keep a brief diary of their observations. At the end of the week the lesson in school consists in collecting these observations from the class, who are encouraged to state them orally, and to freely illustrate them with simple sketches boldly done in outline on the blackboard. The teacher is able to test whether they have gone into the why and the how of any of the points, and at the same time he can indicate how they might have further continued their investigations in order to gain increased knowledge of the subject. At first the observations of the pupils will perforce be somewhat crude, scanty and disjointed, but with guidance from the teacher, with occasional hints and helpful criticism—not overdone, however—it is delightful to note how the spirit of emulation works through the class, awakening their interest, rousing their enthusiasm, imperceptibly directing the pupils into the practice of scientific inquiry. Under these conditions it is not of prime importance that the pupils should lay up a store of facts. It does not much matter if their progress seems slow, so long as they are learning how to gain knowledge for themselves—and that not from books only, but direct from Nature, by their own effort.

In following this method, however, care must be taken to check hasty conclusions, drawn maybe from observation of only one instance. It cannot too soon be brought home to the pupil that before he draws up his general statement he must verify his discoveries by further observations of many instances—maybe under varying conditions of environment. If the teacher related to the class, in a simple manner, how some one of our great scientists sets out to obtain results on which to build a scientific statement, how carefully and methodically every detail was substantiated, every objection considered, the pupils could not fail to be impressed with the need for repeated observation under the same and also varying conditions, for untiring and steady application, and for keen attention to detail.

If this method of discovery were more extensively adopted, we should no longer see lessons given in school on the parts of a plant. Instead, the children would be encouraged to trace it all out for themselves in the school garden—to build up a sort of plant biography. The plant would be observed as it gradually passed through all its stages. The microscope would be freely used and comparisons made with other plants in similar stages of growth. The pupils' drawings—simple sketches done on the spot direct from Nature—would form the best notes they could make. Not only would the general appearance of the plant be noted, but the pupils would be encouraged to reason out why certain things are as they find them. Nothing would be taken as granted. Questions would arise on all sides and provide fruitful sources for discussion and investigation. Is there a reason for the form and nature of the seed and its covering ? Why are some seeds smooth, others sticky ; some good to eat, others poisonous ; some with wings, others like little spheres ; some dull and almost colourless, while others are gaily coloured ? How is it that plants which flower early or late in the year so frequently are bulbous, while plants which flower in the summer generally have fine, fibrous roots ? What is there stored away in the bulb ? Why have we chosen this particular soil and position for this seed ? What birds and insects do we note as frequenting the garden ? Are they friends or enemies ? How does the plant get its food ? What is the formation of the buds ? How do they spread out ? What different shapes can we trace among the leaves ? How do the leaves arrange themselves in order to gain the maximum amount of sun ? Can we trace any arrangement of the leaves about the stem which is common to this particular species of plant ? What advantage can there be in so many flowers closing up their petals during a shower of rain ? How do these hairs on the stem, or these prickles underneath the flower, aid the plant ? What draws the ant and the bee to the flower ? Are their visits of advantage to the plant ?

These are but a few of the lines of investigation which the teacher can suggest to his pupils. Quite a series of interesting discovery lessons could be based upon the dispersion of seeds alone. Can you not picture the delight of the boy who is first to discover the advantage of the mistletoe berry being sticky ? And the still keener delight of the fortunate pupils who are told the old myth, which accounts for the mistletoe bringing forth fruit so much like tears ?

If the lessons are taken, as far as is possible, in a seasonal order, the garden will yield its store of secrets for investigation all the year round. A little space in the garden should be reserved for creeping and climbing plants, as their life history affords profitable study.

It may be necessary frequently to supplement the knowledge gained by the children from their observations, but they should be encouraged to ferret out as much as possible by their own effort. The older scholars might with advantage have free access to a small school library selected judiciously from the many helpful books now published. It is surprising in this connexion to note how few schools possess such a book as White's *History of Selborne*! A teacher would have little difficulty in getting together a suitable library of good reference books.

There is a big temptation to use these discovery lessons for exhibition purposes. This is to be deprecated, for it often leads to unnecessarily elaborate notes and drawings, to wearisome collections of dried plants and flowers, to amazing and intricate charts prettily coloured. The natural consequence is that the children suffer from a mass of irksome routine. When it becomes routine it is time to leave the subject. For instance, barometric and thermometric charts prepared by the pupils, and sensibly connected with the weather, are decidedly useful, but it is valueless to insist that they shall be kept when all the interest has fled. After a time such records become easy to make and probably will be made in an aimless manner and considered as charts alone, not connected with weather forecasts. At any rate they cannot fail to exert a somewhat cramping and deadening influence upon the pupil's nature, while under skilful, sympathetic guidance, these discovery lessons are intended to develop, widen, deepen, the finer sympathies and perceptions, and to provide for the pupil a valuable training in self-reliance.

II

METEOROLOGICAL OBSERVATIONS

Although for gardening it is not absolutely necessary that formal meteorological observations should be made daily, yet it is one of the means by which true method may be introduced into school life; it also encourages the boys to reason correctly and to deduce cause and effect, and also improves their arithmetical work. The observations which can with advantage be made may be divided into two classes.

(*a*) Those which need no instruments (qualitative).

(*b*) Those which need instruments (quantitative).

The first class would deal with direction or absence of wind, the variety of cloud, and whether high up or low down.

The clearness or cloudiness of the air.

Presence or absence of fog.

Presence or absence of direct sunshine.

The second class, dealing with the temperature, the barometric height, the rainfall, and so forth.

It is not intended that the observations should be those of a regular meteorological observatory, measuring actual hours of bright sunshine, the velocity of the wind, &c.

USEFUL TABLE ON THE WIND

Miles per hour	*Feet per second*	*Pressure in lb. per square foot*	*Description*
1	1·47	·005	Hardly perceptible.
3	4·4	·044	Just perceptible.
5	7·33	·123	Light breeze.
7	10·26	·320	Gentle wind.
10	14·67	·500	Brisk wind.
20	29·3	2·000	Very brisk wind.
30	44·0	4·500	Strong wind.
40	58·6	8·000	Very strong wind
50	73·3	12·400	Storm.
60	88·0	17·900	Heavy storm.
80	117·3	31·500	Hurricane.
100	146·6	49·500	Terrific hurricane.

Temperature. The temperatures are taken by a Fahrenheit minimum and maximum thermometer, which is placed not in a Stevenson screen but against a broad piece of wood, the back to the south, which stands 4 feet out of the ground, with top and side protectors, so that the thermometer is in the shade.

The records are taken about 8.45 a.m. each morning, at which time the magnet is used to set the needles in the mercury for the next twenty-four hours.

Additional thermometers, a dry and also a wet bulb one, may be used when the humidity of the air is registered.

A wet bulb thermometer may be easily made by wrapping the bulb of an ordinary thermometer in muslin, with threads immersed in water in a small vessel fixed under the bulb.

The barometer is used at few schools, but where used adds additional interest to the work. It should hang perpendicularly, and be placed about 5 feet high in a good light so that it can be read easily. The less the fluctuations of temperature where the instrument hangs the better it is for recording accuracy.

Rainfall. The rainfall may be taken without an expensive outfit.

In Oxfordshire, a glass funnel 6 inches in diameter with a cubic centimetre measuring-glass, and a large glass bottle are the only things used.

The funnel fits the neck of the bottle so that there is no drift, and is about 1 foot from the ground so as to avoid splashing.

The apparatus is placed in an open situation and fixed so as not to be blown over by strong winds—by standing in a 4-inch drain-pipe sunk into the ground, or by stakes driven into the ground between which the bottle stands.

The conversion of the rainfall in cubic centimetres to inches provides useful and interesting sums for the scholars, which sums can be extended ad lib. by the teacher.

III

FLOWER-POTS

Name.	*Diameter of top in inches.*	*Depth in inches.*	*Number to a cast.*
Thimbles	2	2	72
Thumbs	2½	2½	72
Sixties	3	3½	60
Fifty-fours	4	4	54
Forty-eights	5	5	48
Thirty-twos	6	6	32
Twenty-fours	8½	8	24
Sixteens	9½	9	16
Twelves	10½	10	12
Eights	11½	11	8
Sixes	12½	12	6
Fours	14	13	4
Twos	15	14	2
Ones	18	15	1

It must be observed that at nearly every pottery the sizes vary somewhat.

IV

WEIGHTS AND MEASURES

A tally of cabbage is 5 dozen.

A bundle of asparagus, from 100 to 125 heads.

A bundle of rhubarb from 20 to 30 sticks.

A bunch of carrots from 36 to 40.

A bunch of turnips from 20 to 25.

A bunch of radishes from 12 to 30.

A *Bushel Basket* is 14½ inches in diameter at top, 10 inches in diameter at the bottom, and 17 inches in depth.

A *Junk* contains two-thirds of a bushel.

A *Half Sieve* contains 3½ imperial gallons. It averages 12½ inches in diameter and is 6 inches in depth.

A *Sieve* contains 7 imperial gallons. It is 15 inches in diameter and 8 inches in depth.

A *Bushel Sieve* contains 10½ imperial gallons. The diameter at the top is 17¾ inches, and at the bottom 17 inches, and the depth 11¼ inches.

A *Stone* equals 14 pounds.

A *Crate* of cabbages or broccoli contains 5 to 6 dozen.

A *Flat* of cucumbers contains 3 to 4 dozen.

A *Peck* of strawberries weighs 12 pounds net.

A *Pot* is an oblong wicker basket, 21 inches long, 14 inches wide, and 15 inches in depth.

A *Kipe* is a round wicker basket, 18 inches wide at the top, 12 inches wide at the bottom, and 12 inches in depth.

A *Pottle* is a long tapering basket that holds rather over a pint and a half.

Punnets vary in size. A Salad Punnet is 5 inches wide and 2 inches in depth. A Radish Punnet is 8 inches wide and 1 inch in depth. A Mushroom Punnet is 7 inches in diameter and 1 inch in depth.

A bag of Potatoes is 126 ℔.

A bag of Brussels Sprouts is 28 ℔.

A box of Currants is 6 ℔.

A box of Potatoes is 18 ℔.

A barrel of Apples contains 120 to 140 ℔.

A barrel of Potatoes contains 84 ℔.

A chip-basket of Raspberries contains 4 ℔.

A chip-basket of Strawberries contains 3 to 4 lb.

A bushel of Apples contains 40 to 44 ℔.

A bushel of Plums contains 52 ℔.

A bushel of Peas contains 30 to 36 ℔.

A bushel of Spinach contains 16 to 20 ℔.

A case of Apples contains 40 ℔.

A case of Onions contains 120 ℔.

A sack of Potatoes contains 168 ℔.

A sack of Broccoli contains 60 to 70.

V

GOLDEN RULES FOR YOUNG GARDENERS

1. Always carry a notebook and pencil with which to put down things of interest and work done.
2. When in the garden, learn where to put your feet.
3. Never go by a weed or an injurious insect without destroying it.
4. Before beginning an operation know what tools you will require and take them all with you.
5. Complete one operation before beginning another.
6. Thoroughly clean all tools before putting them away.
7. Have a place for everything, and see that everything is in its place.
8. Perform every operation in its season and do it well.
9. Be clean and tidy ; and systematic and thorough in all your work.
10. Put into everything you do brains, hands, and heart, and then success is assured.

VI

DISTANCES APART TO PLANT FRUIT TREES AND BUSHES

Standard trees.—Apples, Pears, Plums, and Cherries, 20 to 24 feet.

Half-standard trees, 10 to 12 feet.

Pyramid trees.—Apples or Pears, 8 to 10 feet.

Bush trees.—Apples or Pears, 8 to 10 feet.

Single upright cordons.—Apples or Pears, 2 to 3 feet.

Fan or horizontally trained trees.—Apples, &c., 15 to 20 feet.

Bush fruits.—Gooseberries and Currants, 3 to 5 feet.

Raspberries 6 feet from row to row, and the plants 18 inches apart in the row.

Strawberries 2 to 2½ feet from row to row, and the plants 1½ to 2 feet apart in the row.

VII

TABLE OF SIX YEARS' WORK, 1902 TO 1907 INCLUSIVE, ON A SCHOOL GARDEN

Crop	*Variety*	*Year grown*	*Seed sown or planted*	*Date sown or planted*	*Length of row in feet*	*Yield*	*Remarks*
Artichokes, Jerusalem	Sutton White	1902	2 gall.	March 13	54	28 lb.	No demand.
,, ,,	,, ,,	1903	1 gall.	April 8	54	2 bush.	
,, ,,	,, ,,	1904	2 gall.	March 3	57	1½ ,,	
,, ,,	,, ,,	1905	1 gall.	Feb. 10	57	2½ ,,	
,, ,,	,, ,,	1906	1 ,,	March 19	54	1 ,,	
,, ,,	,, ,,	1907	2 gall.	Feb. 28	54	2 ,,	
Beans, Broad	Prolific Longpod	1902	½ pint	March 17	28½	14 lb.	
,, ,,	Exhibition	1902	½ ,,	,, 17	28½	14 ,,	
,, ,,	Prolific Longpod	1903	½ ,,	,, 20	28	7 ,,	The rooks ate more than half the seed. Little demand.
,, ,,	Mammoth ,,	1903	½ ,,	,, ,,	28	7 ,,	The rooks ate more than half the seed. Little demand.
,, ,,	Green Giant	1905	½ ,,	,, 18	27	28 ,,	
,, ,,	,, ,,	1906	1 ,,	,, 31	54	49 ,,	
,, ,,	,, ,,	1907	1 ,,	,, 22	108	56 ,,	Pods very fine; many quite 1 ft. long.
,, Dwarf	Canadian Wonder	1902	½ ,,	April 11	58½	56 ,,	Good crop. No demand.
,, ,,	Golden Waxpod	1902	½ ,,	,, 11	58½	60 ,,	,, ,, ,, ,,

Beans,	Dwarf	Canadian Wonder	1905	½ pint	May 4	27	5 gall.	Good crop. No demand.
,,	,,	,, ,,	1906	¼ ,,	May 4	27	1 peck	Crop spoilt by drought.
,,	,,	,, ,,	1907	½ ,,	April 24	54	2 pecks	Good crop, but suffered from drought.
,,	Climbing	Tender and True	1903	¼ ,,	May 13	28	1 gall.	Good crop. No sale.
,,	Runner	A 1	1902	½ ,,	,, 2	58½	14 lb.	,, ,, ,, ,,
,,	,,	Best of All	1902	½ ,,	,, 2	58½	7 ,,	,, ,, ,, ,,
,,	,,	,, ,,	1903	½ ,,	,, 13	28	4 gall.	,, ,, ,, ,,
,,	,,	Scarlet	1905	½ ,,	,, 4	27	2 ,,	Poor crop, owing to drought in July.
,,	,,	,,	1906	½ ,,	,, 4	27	3 ,,	Almost a failure owing to drought.
,,	,,	Best of All	1907	½ ,,	April 24	54	1 ,,	Good crop. No sale. Soon over, owing to dry September.
Beet		Pine Apple	1902	1 oz.	,, 25	57	56 lb.	Seeds germinated very irregularly.
,,		,, ,,	1903	1 ,,	May 13	112	28 ,,	Roots small, colour and quality good.
,,		Blood Red	1904	1 ,,	April 19	114	56 ,,	Seed germinated thinly and unevenly. Half had to be transplanted.
,,		Perfection	1905	½ ,,	,, 17	108	56 ,,	Roots small, but excellent in colour and flavour.
,,		Globe	1906	½ ,,	May 4	48	42 ,,	Very satisfactory, medium size, handsome roots of excellent flavour. Sold well.
,,		Perfection	1906	½ ,,	,, 4	60	42 ,,	Roots rather small.
,,		Pine Apple	1907	1 ,,	April 24	52	56 ,,	A good shape, colour, and flavour.
,,		Market Favourite	1907	1 ,,	,, 24	52	60 ,,	Large roots.
Broccoli		Michaelmas White	1902	¼ ,,	March 25	117	40	Good quality.
,,		Late Queen	1902	¼ ,,	,, 25	174½	80	Did well. Ready sale.
,,		Satisfaction	1903	¼ ,,	,, 5	108	40	
,,		Late Queen	1903	¼ ,,	,, 25	108	50	
,,		Satisfaction	1904	⅛ ,,	,, 16	57	—	The plants were damaged a good deal by the severe frosts. Results nil.
,,		Standwell	1904	⅛ ,,	,, 16	57	—	
,,		Knight's Protecting	1904	⅛ ,,	,, 16	171	—	
,,		Late Queen	1905	¼ ,,	,, 3	114	50	
,,		Snow White	1905	¼ ,,	,, 3	114	60	
,,		Autumn Protecting	1905	¼ ,,	,, 3	171	12	

TABLE OF SIX YEARS' WORK *(continued)*

Crop	*Variety*	*Year grown*	*Seed sown or planted*	*Date sown or planted*	*Length of row in feet*	*Yield*	*Remarks*
Broccoli	Snow White	1906	¼ oz.	March 17	108	36	Small, but of good quality.
,,	Autumn Protecting	1906	¼ ,,	,, 17	108	36	
,,	Late Queen	1906	¼ ,,	,, 17	108	60	
,,	Michaelmas White	1907	¼ ,,	Feb. 25	216	40	
,,	Snow White	1907	¼ ,,	April 5	54	30	
,,	Late Queen	1907	¼ ,,	,, 5	162	80	
Brussels Sprouts	Matchless	1902	½ ,,	March 4	292½	½ bush.	
,, ,,	Exhibition	1902	½ ,,	,, 4	75½	½ ,,	
,, ,,	Dwarf Gem	1903	¼ ,,	,, 3	171	2 gall.	A good crop. The buttons did not develop well, owing to the want of sunshine.
,, ,,	Exhibition	1903	¼ ,,	,, 3	114	4 ,,	
,, ,,	Dwarf Gem	1904	⅛ ,,	Feb. 15	57	8 ,,	
,, ,,	Exhibition	1904	⅛ ,,	,, 25	57	10 ,,	
,, ,,	Matchless	1905	¼ ,,	March 3	114	2 bush.	
,, ,,	Exhibition	1905	¼ ,,	,, 3	114	2½ ,,	
,, ,,	Matchless	1906	¼ ,,	,, 17	108	2½ ,,	
,, ,,	Exhibition	1906	¼ ,,	,, 17	108	2 ,,	
,, ,,	Dwarf Gem	1907	⅛ ,,	Feb. 25 March 2	162	40 lb.	
,, ,,	Exhibition	1907	⅛ ,,	Feb. 25 March 2	162	56 ,,	
Borecole or Kale	A 1	1902	⅛ ,,	March 17	175½	75	
,, ,,	Extra Curled Scotch	1902	⅛ ,,	,, 17	175½	75	
,, ,,	A 1	1903	¼ ,,	March 30	108	50	

Borecole or Kale	A 1	1904	$\frac{1}{8}$ oz.	Feb. 27	114	72	
,, ,,	A 1	1905	$\frac{1}{4}$,,	March 3	114	60	
,, ,,	A 1	1906	$\frac{1}{4}$,,	,, 17	54	27	
,, ,,	A 1	1907	$\frac{1}{4}$,,	April 5	108	54	
Cabbage	All Heart	1902	$\frac{1}{4}$,,	Feb. 28	175½	18	No demand.
,,	Earliest	1903	$\frac{1}{4}$,,	,, 21	81	Not given	
,,	Flower of Spring	1903	$\frac{1}{4}$,,	,, 21	81	,, ,,	
,,	Ellam's Early	1903	$\frac{1}{2}$,,	,, 21	342	180	Only one plant ran to seed.
,,	,, ,,	1904	$\frac{1}{8}$,,	,, 15	114	68	The cabbages were good and sold well.
,,	Earliest	1904	$\frac{1}{8}$,,	,, 15	57	48	
,,	April	1904	$\frac{1}{8}$,,	,, 15	57	48	
,,	,,	1905	$\frac{1}{4}$,,	March 3	162	120	Very good.
,,	Imperial	1905	$\frac{1}{4}$,,	,, 3	162	120	
,,	Earliest	1905	$\frac{1}{4}$,,	,, 3	162	120	
,,	,,	1906	$\frac{1}{4}$,,	,, 17	108	72	Cabbage smaller than usual and did not remain good so long as in ordinary seasons.
,,	April	1906	$\frac{1}{4}$,,	Feb. 25	108	36	
,,	Earliest	1907	$\frac{1}{8}$,,	March 2	216	156	Rather small, but of good quality.
Carrots	Favourite	1902	$\frac{1}{2}$,,	April 15	142½	112 lb.	Good shape and fine roots.
,,	New Red Intermediate	1902	$\frac{1}{2}$,,	,, 15	142½	112 ,,	Good. A few forked.
,,	Favourite	1903	$\frac{1}{2}$,,	,, 6	216	112 ,,	Good size. A larger proportion than usual split.
,,	New Red Intermediate	1903	$\frac{1}{2}$,,	,, 6	216	112 ,,	
,,	Favourite	1904	$\frac{1}{2}$,,	,, 7	228	112 ,,	Does well in this soil.
,,	New Red Intermediate	1904	$\frac{1}{2}$,,	,, 7	228	112 ,,	Rather forked.
,,	Favourite	1905	$\frac{1}{2}$,,	March 31	108	84 ,,	The long continued drought prevented them being thinned at the proper time.
,,	New Red Intermediate	1905	$\frac{1}{2}$,,	,, 31	108	56 ,,	
,,	Favourite	1906	$\frac{1}{2}$,,	,, 30	108	84 ,,	The best for this soil.
,,	New Red Intermediate	1906	$\frac{1}{2}$,,	,, 30	108	84 ,,	
,,	Favourite	1907	$\frac{1}{8}$,,	April 6	108	56 ,,	
,,	New Red Intermed.	1907	$\frac{1}{8}$,,	,, 6	108	84 ,,	

TABLE OF SIX YEARS' WORK *(continued)*

Crop	*Variety*	*Year grown*	*Seed sown or planted*	*Date sown or planted*	*Length of row in feet*	*Yield*	*Remarks*
Celery	White Gem	1902	$\frac{1}{8}$ oz.	Feb. 21	175$\frac{1}{2}$	135	
,,	A 1 (Red)	1902	$\frac{1}{8}$,,	,, 21	234	177	
,,	Solid White	1904	$\frac{1}{8}$,,	,, 15	57	60	
,,	Wright's Giant White	1904	$\frac{1}{8}$,,	,, 15	57	60	The weakest of the four sorts.
,,	A 1 (Red)	1904	$\frac{1}{8}$,,	,, 15	57	70	
,,	Leicester Red	1904	$\frac{1}{8}$,,	,, 15	57	60	
,,	A 1 (Red)	1905	$\frac{1}{8}$,,	March 2	108	80	Poor crop and very small. Many ran to seed during the very dry July.
,,	White Gem	1905	$\frac{1}{8}$,,	,, 2	108	70	
,,	Sandringham White	1906	$\frac{1}{8}$,,	,, 10	108	24	A comparative failure owing to the very dry soil.
,,	A 1 (Red)	1906	$\frac{1}{8}$,,	,, 10	108	38	
,,	White Gem	1907	$\frac{1}{8}$,,	,, 2	54	12	A very poor crop, not worth the trouble of growing. Light cornbrash soil and no water supply make celery-growing hopeless.
,,	A 1 (Red)	1907	$\frac{1}{8}$,,	,, 2	54	12	
Cauliflower	Early Giant	1902	$\frac{1}{4}$,,	,, 14	117	46	Very good.
,,	Autumn Mammoth	1902	$\frac{1}{4}$,,	,, 14	175$\frac{1}{2}$	70	
,,	Purity	1903	$\frac{1}{4}$,,	,, 25	114	20	Not so good as last year. Wet season.
,,	Autumn Mammoth	1903	$\frac{1}{4}$,,	,, 27	114	40	
,,	Purity	1904	$\frac{1}{8}$,,	Feb. 15	114	44	Excellent in quality though not large in size.
,,	Autumn Mammoth	1904	$\frac{1}{8}$,,	,, 15	171	48	Large in size and of good quality.
,,	Purity	1905	$\frac{1}{4}$,,	,, 21	162	40	

Cauliflower	Autumn Mammoth	1905	¼ oz.	Feb. 21	108	30	
,,	Purity	1906	¼ ,,	March 17	108	36	Rather small. Excellent quality.
,,	Autumn Mammoth	1906	¼ ,,	,, 17	108	24	Not so good as usual; suffered more from drought than Purity.
,,	Early Giant	1907	⅛ ,,	Feb. 25 April 5	162	36	A very good crop, but came in too much together.
,,	Autumn Mammoth	1907	⅛ ,,	April 5	162	36	
Leeks	Royal Favourite	1902	⅛ ,,	Feb. 21	28½	18	Very good. Some not sold.
,,	,, ,,	1903	¼ ,,	,, 21	114	48	Very good and large in size. Little demand.
,,	Prizetaker	1904	⅛ ,,	,, 15	114	60	Large, clean, and well blanched.
,,	,,	1905	¼ ,,	March 3	216	64	Excellent crop, large and well blanched. 100 not sold.
,,	,,	1906	½ ,,	,, 17	108	96	Very good crop, good size, well blanched.
,,	,,	1907	½ ,,	Feb. 25 March 2	108	48	An excellent crop.
Cos Lettuces	Mammoth White	1902	¼ ,,	,, 28	234	112	Both very good. Those not transplanted less satisfactory.
,, ,,	Superb White	1902	¼ ,,	,, 28	234	100	
,, ,,	,, ,,	1903	¼ ,,	,, 25	57	80	Remarkably good.
,, ,,	Mammoth White	1903	¼ ,,	,, 25	114	80	
,, ,,	White Heart	1904	⅛ ,,	Feb. 15	171	100	The dry summer interfered with this crop.
,, ,,	Superb White	1904	⅛ ,,	,, 15	171	100	
,, ,,	,, ,,	1905	⅛ ,,	March 24	216	200	Excellent crops, large, firm, and of good quality.
,, ,,	Peerless	1905	⅛ ,,	,, 24	216	200	
,, ,,	,,	1906	½ ,,	,, 17	216	80	Many ran to seed. Suffered from want of rain at proper time.
,, ,,	Superb White	1906	½ ,,	,, 17	216	96	
,, ,,	,, ,,	1907	⅛ ,,	Feb. 25 March 2	216	200	Excellent.
Onions	Rousham Park Hero	1902	1 ,,	,, 11	285	56 lb.	A useful onion for general use.
,,	Sutton Globe	1902	½ ,,	,, 11	90	14 ,,	
,,	Improved Reading	1902	½ ,,	,, 11	90	28 ,,	

TABLE OF SIX YEARS' WORK (*continued*)

Crop	*Variety*	*Year grown*	*Seed sown or planted*	*Date sown or planted*	*Length of row in feet*	*Yield*	*Remarks*
Onions	A 1	1902	½ oz.	March 11	90	28 lb.	The largest bulbs and the latest in ripening.
,,	Cranston's Excelsior	1903	¼ ,,	,, 20	112	112 ,,	An excellent onion.
,,	Nuneham Park	1903	¼ ,,	,, 20	112	56 ,,	
,,	Bedfordshire Champion	1903	¼ ,,	April 3	112	84 ,,	
,,	A 1	1903	¼ ,,	,, 3	112	84 ,,	
,,	Danver's Yellow	1904	¼ ,,	Feb. 13	72	14 ,,	Failure.
,,	Blood Red	1904	¼ ,,	,, 13	114	21 ,,	No good.
,,	Cranston's Excelsior	1904	¼ ,,	,, 13	114	56 ,,	Very good.
,,	A 1	1904	¼ ,,	,, 13	114	56 ,,	Very good.
,,	Brown Globe	1905	½ ,,	,, 18	108	28 ,,	Fair.
,,	Improved Reading	1905	½ ,,	,, 18	108	28 ,,	Very fair.
,,	Ailsa Craig	1905	½ ,,	,, 18	108	56 ,,	Very good.
,,	A 1	1905	½ ,,	,, 18	108	42 ,,	Good.
,,	James's Long-keeping	1906	½ ,,	March 17	108	42 ,,	
,,	Improved Reading	1906	½ ,,	,, 17	108	42 ,,	
,,	Ailsa Craig	1906	½ ,,	,, 17	108	140 ,,	Very good.
,,	A 1	1906	½ ,,	,, 17	108	56 ,,	Good.
,,	James's Long-keeping	1907	½ ,,	Feb. 27	108	48 ,,	
,,	Improved Reading	1907	½ ,,	,, 27	108	30 ,,	

Onions	Ailsa Craig	1907	½ oz.	Feb. 27	108	84 lb.	Very good.
„	A 1	1907	½ „	„ 27	108	58 „	
Parsnips	Tender and True	1902	½ „	March 18	285	126 „	A good parsnip.
„	„ „	1903	½ „	„ 21	228	115 „	
„	„ „	1904	½ „	„ 28	114	84 „	Rather forked.
„	Elcombe's Improved	1904	½ „	„ 28	114	56 „	
„	Tender and True	1905	½ „	„ 20	108	56 „	
„	The Student	1905	½ „	„ 20	108	56 „	
„	Tender and True	1906	1 „	„ 17	216	56 „	
„	„ „	1907	1 „	„ 16	216	56 „	
Peas	Early Giant	1902	½ pint	April 18	28½	17½ „	
„	Prize Winner	1902	½ „	„ 18	28½	14 „	
„	Early Giant	1903	½ „	May 21	27	14 „	
„	Perpetual	1903	½ „	June 6	27		A failure owing to the wet season.
„	Early Giant	1904	½ „	May 8	28½	7 „	Owing to the dry weather and the rooks the crop was very poor.
„	Lord Roberts	1904	½ „	„ 8	28½	8 „	
„	Early Giant	1905	½ „	„ 4	27	21 „	The July drought spoilt very promising crops.
„	Green Gem	1905	½ „	„ 4	27	7 „	
„	Exhibition	1905	½ „	„ 4	27	7 „	
„	Late Queen	1905	½ „	„ 4	27	14 „	
„	Early Giant	1906	½ „	„ 4	27	7 „	Poor crop. Quickly over on account of drought.
„	Late Queen	1906	½ „	„ 4	27	7 „	
„	Early Giant	1907	1 „	April 24 June 8	54	56 „	The earliest crops were good, the later ones suffered from drought.
„	Late Queen	1907	1 „	April 24 June 8	54	28 „	
„	Perpetual	1907	½ „	June 10	54	28 „	
Potatoes	May Queen	1902	7 lb.	March 26	57	14 „	Very small. The tops were cut down with late frosts and never recovered.
„	Triumph	1902	7 „	„ 26	57	14 „	„ „
„	Epicure	1902	7 „	„ 26	57	14 „	Very poor.
„	Windsor Castle	1902	7 „	„ 26	57	14 „	„ „
„	Centenary	1902	7 „	„ 26	57	14 „	Very small.
„	Reliance	1902	7 „	„ 26	57	14 „	Fair size.
„	Duke of York	1903	7 „	April 3	84	14 „	Very poor crop and very small tubers.

TABLE OF SIX YEARS' WORK (*continued*)

Crop	*Variety*	*Year grown*	*Seed sown or planted*	*Date sown or planted*	*Length of row in feet*	*Yield*	*Remarks*
Potatoes	Ninety-Fold	1903	7 lb.	April 6	56	14 lb.	Very poor crop and very small tubers.
,,	Windsor Castle	1903	7 ,,	,, 8	56	42 ,,	Very good. Usable size. Few diseased.
,,	Flourball	1903	7 ,,	,, 8	56	28 ,,	A fair crop of medium-sized tubers.
,,	Windsor Castle	1904	7 ,,	,, 2	58½	56 ,,	The best variety for this soil.
,,	Flourball	1904	7 ,,	,, 2	58½	56 ,,	
,,	Maincrop	1904	7 ,,	,, 2	58½	70 ,,	
,,	Evergood	1904	7 ,,	,, 2	58½	56 ,,	
,,	Sir J. Llewelyn	1905	7 ,,	,, 8	57	28 ,,	A very poor crop. The frost on May 23 and the dry July doing great damage.
,,	Evergood	1905	7 ,,	,, 8	57	28 ,,	
,,	Windsor Castle	1905	7 ,,	,, 8	57	28 ,,	
,,	Maincrop	1905	7 ,,	,, 8	57	28 ,,	
,,	Sir J. Llewelyn	1906	7 ,,	,, 27	54	42 ,,	Would have been an excellent crop if the weather had not been so dry in late summer.
,,	Windsor Castle	1906	21 ,,	,, 27	162	112 ,,	
,,	Evergood	1906	7 ,,	,, 27	54	14 ,,	
,,	Up-to-Date	1906	7 ,,	,, 27	54	56 ,,	
,,	Maincrop	1906	21 ,,	,, 27	162	56 ,,	
,,	Sir J. Llewelyn	1907	7 ,,	,, 20	54	56 ,,	All were good. Very little disease.
,,	Windsor Castle	1907	7 ,,	,, 20	54	56 ,,	
,,	Evergood	1907	7 ,,	,, 20	54	84 ,,	
,,	Up-to-Date	1907	7 ,,	,, 20	54	70 ,,	
Turnips	Red Globe	1902	½ oz.	,, 8	58½	112 ,,	Rather bad shape.
,,	Early Snowball	1902	½ ,,	,, 8	57	168 ,,	Very good.
,,	Red Globe	1903	½ ,,	April 8 July 25	399	224 ,,	,, ,,
,,	Snowball	1903	½ ,,	,, 22	285	112 ,,	,, ,,
,,	Red Globe	1904	½ ,,	April 8	85½	224 ,,	Excellent.
,,	Perfection	1904	½ ,,	,, 8	85½	14 ,,	Useless.
,,	Red Globe	1905	½ ,,	March 22	56	112 ,,	Turnip-fly was very destructive.

Turnips	Criterion	1905	½ oz.	March 22	56	28 lb.	Turnip-fly was very destructive.
,,	Red Globe	1906	1 ,,	March to July	108	84 ,,	Early sowings destroyed by fly.
,,	Early Snowball	1906	1 ,,	,,	108	56 ,,	
,,	Red Globe	1907	½ ,,	April 6	52	100 ,,	
,,	Early Snowball	1907	½ ,,	,, 6	52	150 ,,	
Savoys	Perfection	1903	⅛ ,,	May 3	57	50	Not large, but hearts very firm and of good quality.
,,	Best of All	1903	⅛ ,,	,, 3	57	50	
,,	Perfection	1904	⅛ ,,	March 16	28½	30	Small, but good quality.
,,	Sugar-loaf	1905	¼ ,,	,, 3	108	32	Not large, but very good.
,,	Best of All	1906	¼ ,,	,, 17	54	36	Better than Sugar-loaf.
,,	Sugar-loaf	1906	¼ ,,	,, 17	54	12	
,,	Best of All	1907	⅛ ,,	,, 2	54	42	Medium size, good quality. Not so good as Best of All.
,,	Sugar-loaf	1907	⅛ ,,	,, 2	54	24	
Vegetable Marrows	Long-Green	1902	6 seeds	April 22	27	8	Very good.
,, ,,	Pen-y-byd	1902	6 ,,	,, 22	27	12	
,, ,,	White Bush	1903	6 ,,	,, 23	27	7	Did not fruit well.
,, ,,	Long Cream	1903	6 ,,	,, 23	27	12	
,, ,,	White Bush	1904	6 ,,	,, 23	28½	13	Not much demand.
,, ,,	Pen-y-byd	1905	20 seeds	,, 17	27	16	Excellent quality. A very useful variety.
,, ,,	Long Cream	1906	12 ,,	,, 5	27	12	
,, ,,	Pen-y-byd	1906	12 ,,	,, 5	27	20	
Parsley	Imperial Curled	1902	¼ oz.	,, 7	57	12 bush.	Excellent.
,,	Moss Curled	1902	¼ ,,	,, 7	57	11 ,,	Very good.
,,	Imperial Curled	1903	¼ ,,	,, 8	216	12 ,,	Excellent.
,,	,, ,,	1904	½ ,,	,, 16	228	11 ,,	,,
,,	,, ,,	1905	½ ,,	March 20	342	15½ ,,	,,
,,	,, ,,	1906	1 ,,	April 19	162	15½ ,,	,,
,,	,, ,,	1907	1 ,,	,, 6	162	14 ,,	,,

VIII

METEOROLOGICAL RECORDS TAKEN AT A SCHOOL GARDEN, 1902–7

Height above sea-level 238 feet. Shaded Thermometer 2 feet above ground surface. Latitude 51° 54′ N. Longitude 1° 9′ W. Records taken at 8.30 a.m. Diameter of Rain-gauge 9 inches. Total capacity of rain-gauge 13 inches. Height above ground surface 6 inches.

Month	*Year*	*Rain-fall*	*No. of days upon which rain fell*	*Greatest fall in one day*		*Maximum temperature of month*		*Minimum temperature of month*		*Prevailing winds at 8.30 A.M.*							
		Ins.		Ins.	Date	Deg.	Date	Deg.	Date	SW.	S.	E.	NW.	W.	NE.	N.	SE.
*January	*1902	0·13	4	0·2	27	56°	22	19°	14	5	2	2	4	2			
”	1903	2·55	16	0·78	5	53°	7	22°	15	6		18			4	3	
”	1904	3·25	23	0·50	30	52°	14	22°	23	4	7	9	1		2	2	6
”	1905	0·91	12	0·24	4	53°	7	18°	19	6		6			12	1	6
”	1906	3·75	23	0·58	4	52°	27	24°	20	14		5	2		5	1	4
”	1907	1·03	9	0·48	1	50°	2	18°	25	8		8	5	1	7		2
February	1902	0·99	8	0·23	21	54°	28	17°	12	1		7		1	8	6	4
”	1903	0·73	13	0·25	24	60°	10	22°	18	13		9	2	1	2	1	
”	1904	3·61	18	0·87	9	53°	22	24°	29	9	3	5	4		6		2
”	1905	0·50	11	0·12	25	54°	17	26°	25	12	1	4	3		7		1
”	1906	1·59	20	0·25	16	48°	11	19°	6	10		6	5		6		1
”	1907	1·30	12	0·38	12	54°	28	18°	3	5		4	6		8	3	2
March	1902	1·35	11	0·41	14	61°	17	25°	22	4		8	4	3	11	1	
”	1903	3·07	21	0·49	23	66°	26	29°	6	6	1	19	1	1	1	1	1
”	1904	1·25	16	0·27	7	58°	10	24°	12	4	2	5	1		13	3	3
”	1905	2·64	21	0·39	13	63°	23	25°	4	15	2	3	1		6	1	3
”	1906	1·43	20	0·43	10	62°	18	24°	23	11		5	3		12		
”	1907	1·02	12	0·18	19	72°	29	21°	12	10		7	1		11		2
April	1902	1·36	10	0·63	15	66°	19	27°	13	2		9	3	2	9	4	1

		Ins.		Ins.	Date	Deg.	Date	Deg.	Date	SW.	S.	E.	NW.	W.	NE.	N.	SE.
April	1903	2·12	14	0·45	28	63°	29	25°	19	4		6	12	2	2	4	
,,	*1904	0·88	10	0·32	15	67°	19	32°	11	8	1	6	5		2	3	
,,	*1905	1·96	14	0·27	9	63°	17	28°	9	5	1	3	2		11		
,,	1906	0·47	8	0·16	27	70°	14	25°	20	4		7	1		18		
,,	1907	2·33	14	0·50	12	73°	2	27°	20	5		9	1		10	4	1
May	1902	1·65	19	0·31	22	70°	24	27°	13	4	1	5	8	3	3	7	
,,	1903	5·50	17	0·98	5	78°	31	31°	13	4	1	8		1	12	4	1
,,	1904	2·81	17	0·99	26	74°	28	31°	3	8		7	3		10		3
,,	1905	0·78	8	0·55	30	83°	30	27°	23	3	2	3	1	1	17	2	2
,,	1906	1·64	16	0·48	20	75°	9	28°	2	7	1	7	3		12		1
,,	1907	2·39	17	0·71	13	75°	26	33°	19	4		7	1	1	16		2
June	1902	2·28	17	0·41	14	85°	28	35°	9	4		10		1	10	5	
,,	1903	4·65	10	1·18	15	84°	28	34°	21	3		8			8	11	
,,	1904	0·67	8	0·28	13	80°	29	38°	28	6	1	6	3		13		1
,,	1905	3·73	15	0·87	30	74°	23	45°	10	5		6	1		14	4	
,,	1906	3·16	9	1·69	28	87°	9	35°	5	6		2	2		19	1	
,,	1907	2·27	21	0·53	1	74°	15	39°	17	16	1	2	1	1	5	1	3
July	1902	1·29	11	0·29	9	89°	14	35°	11	9	2	5	3	1	2	8	1
,,	1903	3·16	16	0·59	23	88°	11	38°	8	7		12	4	1	5	1	1
,,	1904	2·52	13	1·19	25	90°	11	45°	8	8	1	7			13		2
,,	1905	0·22	9	0·06	9	84°	15	42°	19	12		2	3		13		1
,,	1906	0·98	8	0·47	28	86°	6	40°	1	10	2	9	3		6	1	
,,	1907	2·34	15	0·64	21	87°	20	38°	11	9		4	1		16		1
August	*1902	2·66	14	0·43	7	80°	16	32°	1	5		10	2		4		
,,	*1903	2·85				76°	8	40°	26	6		4	3	2			3
,,	*1904	1·63	8	0·51	22	89°	5	35°	25	4		9			9		1
,,	*1905	2·95	13	0·77	28	77°	4	39°	24	5		8	1		3		2
,,	*1906	1·13															
,,	*1907	1·85															
September	1902	1·92	15	0·73	10	75°	1	33°	18	4	1	12	1	1	5	6	
,,	1903	1·81	17	0·46	10	78°	3	34°	17	4		16	2		5	3	
,,	1904	1·61	11	0·41	30	75°	6	34°	30	2		11	1		15		1
,,	1905	1·21	14	0·42	25	75°	5	33°	15	8		4	1		17		
,,	1906	1·06	8	0·34	13	95°	2	31°	26	3		2	4	1	16	1	3

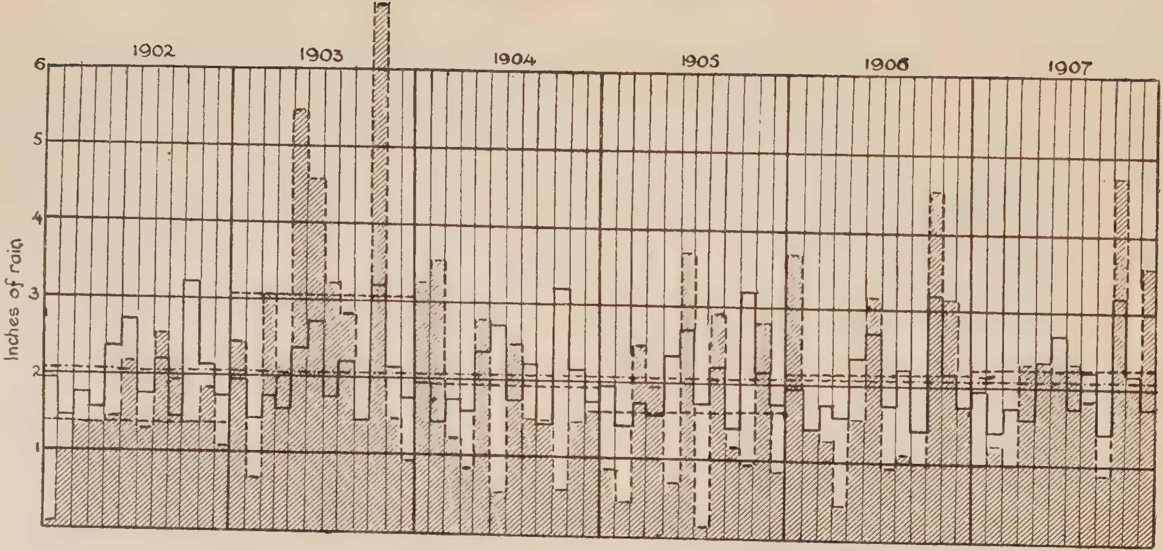
* Full records were not taken.

METEOROLOGICAL RECORDS TAKEN AT A SCHOOL GARDEN, 1902–7
(*continued*)

Month	*Year*	*Rain-fall*	*No. of days upon which rain fell*	*Greatest fall in one day*		*Maximum temperature of month*		*Minimum temperature of month*		*Prevailing winds at 8.30 A.M.*							
		Ins.		Ins.	Date	Deg.	Date	Deg.	Date	SW.	S.	E.	NW.	W.	NE.	N.	SE.
September	1907	0·90	7	0·22	4	80°	26	30°	23	1		4			23	1	1
October	1902	1·38	16	0·31	9	64°	10	30°	18	3		11	3	1	8	5	
„	1903	6·97	27	0·94	27	68°	2	31°	31	8	1	18	2				2
„	1904	0·70	12	0·22	16	67°	19	27°	13	5	1	11	1		10	1	2
„	1905	1·01	15	0·33	29	60°	5	23°	22	6		5	2		18		
„	1906	4·55	22	1·01	2	70°	2	30°	26	4	4	16	1		4		2
„	1907	4·72	21	0·91	16	67°	2	30°	16	1		15		1	11		3
November	1902	1·83	13	0·53	28	57°	6	28°	20			18			11	1	
„	1903	1·56	13	0·68	27	55°	2	25°	20	11	1	2	2	1	4	5	4
„	1904	1·46	14	0·36	10	58°	10	28°	24	5	1	14	1		6	1	2
„	1905	2·87	18	0·59	10	54°	4	21°	21	3		8	1		11	1	6
„	1906	3·18	15	1·19	8	60°	23	26°	19	7	1	4			12		6
„	1907	2·08	23	0·67	26	56°	3	23°	16	4		6	1		15	3	1
December	*1902	1·10	10	0·25	17	52°	16	22°	6	3		4	1		6	5	
„	1903	0·97	15	0·25	12	50°	10	25°	31	1	1	7	1		10	4	7
„	1904	1·69	19	0·37	6	54°	17	22°	22	4		5	1		13		8
„	*1905	0·90	11	0·27	7	53°	8	24°	11	5		10			2		4
„	*1906	1·86	16	0·40	15	53°	5	23°	11	5		8	3	3	3		2
„	1907	3·66	20	0·68	4	53°	9	26°	31	8	1	4	1	1	15		1

* Full records were not taken.

RAINFALL CHART



TEMPERATURE AND RAINFALL CHART

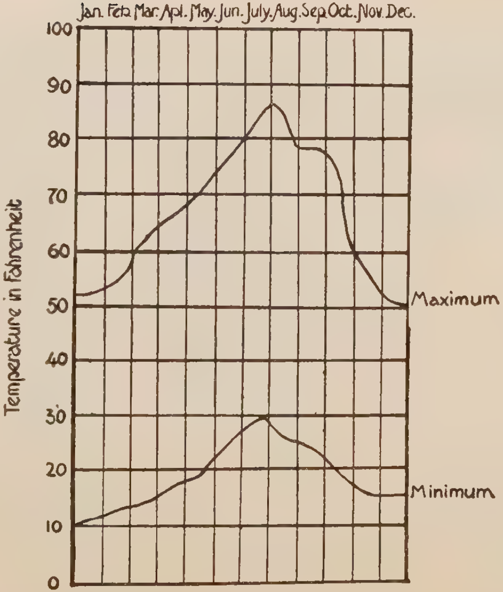


Chart showing average of maximum and minimum temperatures.

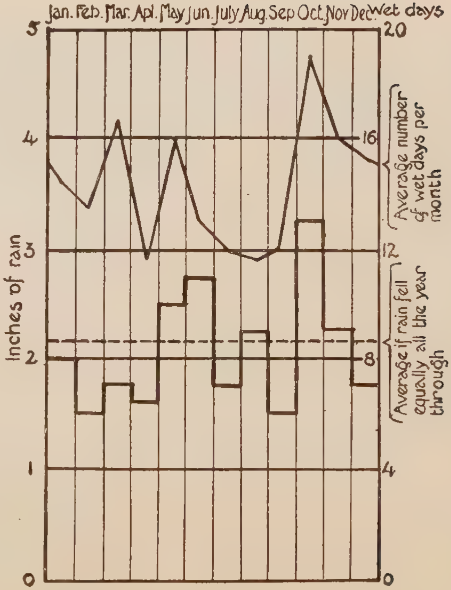
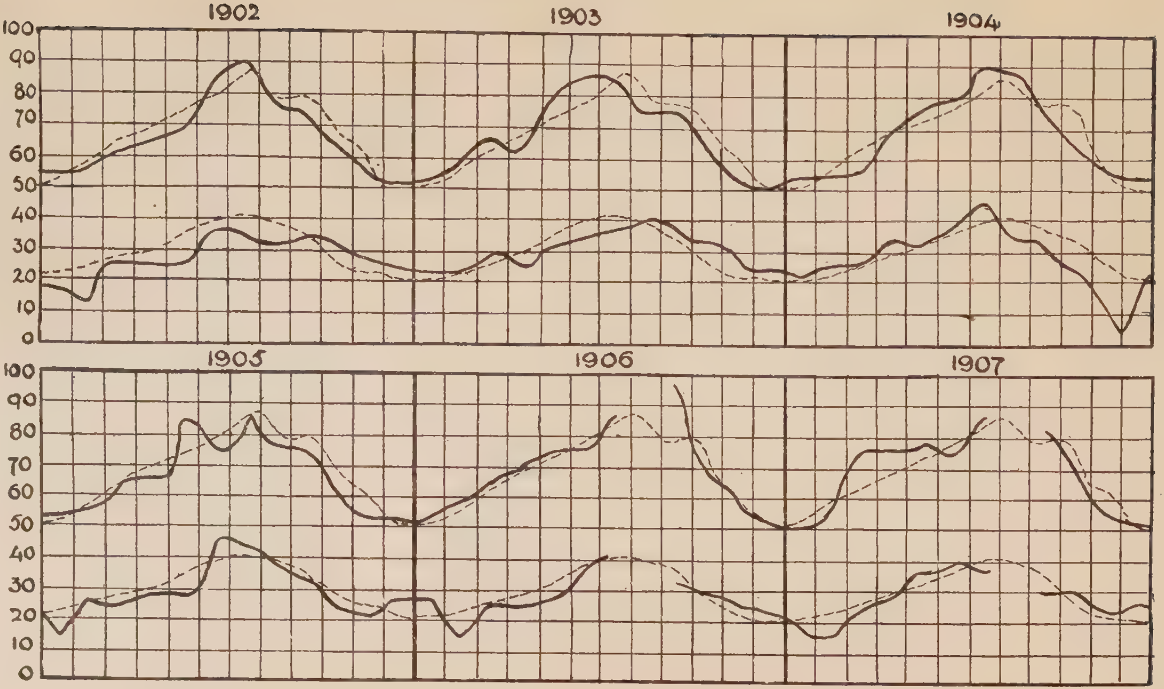


Chart showing average rainfall in each month.

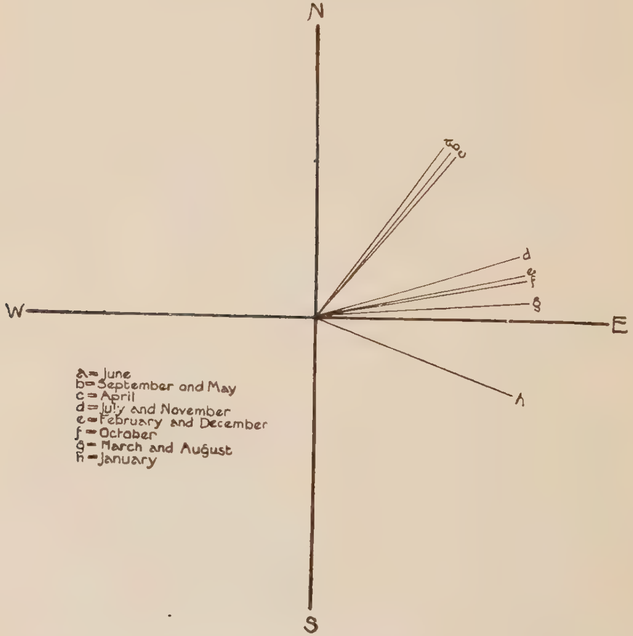
Averages calculated on the six year period

TEMPERATURE CURVES



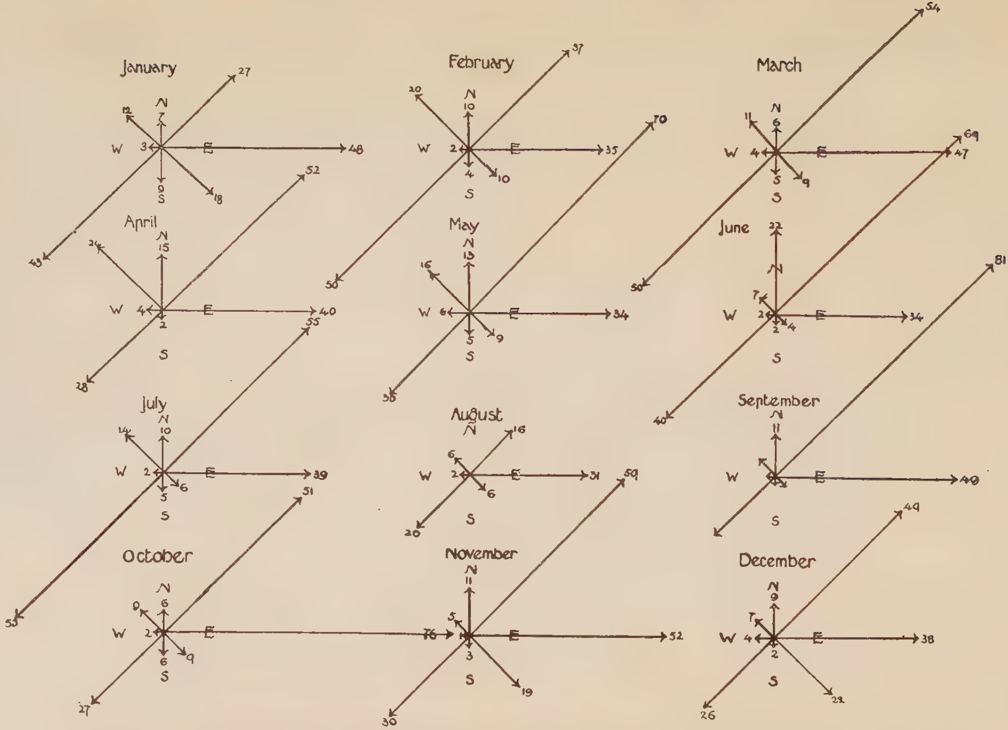
Thick line, showing recorded rainfall. Dotted line showing average of the six-year period.

PREVAILING WINDS



The lines show the average direction of the wind at 8 o'clock in the morning during six years month by month.

WINDY DAYS FOR SIX YEARS



The length of the lines is proportioned to the number of days on which at 8 o'clock in the morning the wind was recorded as blowing in that direction.

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